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ABSTRACT

Research is presented that is derived from the hypothesis that a person's interpretation of emotional stimulus is affected by the painted hue and the light intensity of the visual environment. The reported experiment proved in part a null hypothesis; it was suggested that, within the considered variables of the experiment, either a person's interpretation of emotions is not affected by the environment, or variables not accounted for in the experiment may have influenced the results. A review of literature pertinent to the topic, indications for further research, and a bibliography are included. (JD)

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THE INFLUENCE OF COLOR AND ILLUMINATION ON THE INTERPRETATION OF EMOTIONS

by

Imre Ransome Kohn

A thesis submitted to the faculty of the University
of Utah in partial fulfillment of the requirements
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Master of Arts

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ABSTRACT

The study explored possible differences in the interpretation of an expressed emotion's intensity as a function of painted hues and light intensities within the environment. A review of the literature pertaining to color-affect and the accuracy of decoding vocal qualities and speech content from voice recordings was cited. This study differed from previous research by investigating the effects of color and achromatic lighting on interpretations of emotions; with the use of indoor commercial paint as color stimuli; by keeping the subjects from knowing that color and light are variables relevant to the study's purpose; and by including time as an independent variable.

Twenty-seven subjects were used in a pilot study to establish the levels of each variable (3 colors, 3 hue lightnesses, 3 light intensities, 2 sexes, 3 time periods, and 6 emotions). In the main experiment, 135 men and 135 women were divided into groups of five individuals of the same sex. Each group was assigned to one of 54 experimental conditions (combinations of the above variable conditions).

A tape recording, which contained 204 emotional portrayals of fear, anger, indifference, happy, sad, and flirting, was used as the emotional stimuli. The protrayals were repeated by different speakers, and the order of stimuli was randomized. Each subject rated each emotion's intensity on a nine-point scale during a standard 33 minute session.

The statistical treatment employed was initially a factorial analysis of variance with repeated measures on the time and emotion variables to test for global effects followed by numerous single factor analyses of variance to examine specific questions.

Data from previous research were used to generate the following hypotheses:

1. The judged intensities of emoted phrases differ significantly across varying combinations of color and light for all six emotions.

2. The mean judgment of one emotion increases significantly over the mean judgment of the other emotions under the following conditions: (a) anger in a red room and a yellow room (illumination level "dim"), (c) happy in a room of dark hue lightness and medium hue lightness (illumination level "comfortable"), (d) fear in a blue room and a yellow room (illumination level "dim"), and (e) flirting in a dark red room (illumination level "dim").

3. The mean judgment of each emotion differs significantly between men and women.

4. The mean judgment of each emotion differs significantly with increased exposure of the subjects to the varying conditions.

Two of the four hypotheses were not supported by the results; there were no significant differences in the mean judgment of an emotion's intensity with variations of room color, hue lightness, and illumination. The third hypothesis on differential judgments of emotions by sex was confirmed in part; and the fourth hypothesis on differential judgments over time was confirmed in full. It was noted that although the mean judgments differed between sexes and over time, the variables responsible for such differences may stem from other than the physical environment.

Since few of the tests showed significance, alternative explanations of the results were discussed:

1. The possibility that human perception of emotional portrayals are not influenced by environmental changes.

2. The measure of the dependent variable used is too insensitive for recording environmental effects within the time allowed.

3. The need for additional dependent variables to display the effects of the environment on human behavior and to consider other experimental approaches.

No attempt was made to extrapolate the meaning of the results beyond laboratory conditions. Instead, the focus was on further avenues of research for future efforts.

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CHAPTER I

INTRODUCTION

To learn more of the interpersonal process and, more particularly, the bearing of the physical environment on human relations, it is necessary to become concerned with the interface between architecture and the behavioral sciences; to understand the reactions of people to one another living in intricate and occasionally coherent arrangements of space. Buildings speak; their designs convey ideas which often dominate one's thinking, feeling, and activity. Sometimes the message is forceful, as the Roman intended, or subtle, as the Greeks intended. But even the smallest space has the ability to influence human perception and thus shape the individual's response.

In spite of a general awareness that buildings affect people, there is little experimental evidence that the physical environment has any bearing upon human communication. Architects, artists, interior designers, theatrical stage designers, and advertising agencies, through numerous media, have presumed to manipulate environmental variables to heighten the public's reaction to emotional messages with little more than intuition as a guide. The likelihood that a message may be interpreted differently from one individual to the next with changes in the individual's surroundings often seems to be accepted as an axiom, insofar as the environment is included as a contributing variable to the impact of a communication.

It would seem, then, that there is a great need to systematically examine the manner and degree to which the environment may affect the receiver's interpretation of a message. The purpose of this thesis, therefore, is to measure the effects of two environmental variables (color and light) on the interpretation of emotional communications. In operational terms, the question is: Can the receiver's decoding of the intensity of an emoted communication on a rating scale be influenced by alterations of light intensity, color, and color lightness within the receiver's environment?

The value of such an investigation lies potentially in the gain of knowledge which will aid the design of human environments. In the design of most buildings, the manner in which a person responds to color and light remains unobserved or a consideration of superficial importance. Such environmental factors, however, may create a climate directing affective behavior and may be used meaningfully. A person who is easily depressed and strongly feels that his surroundings reflect an apathetic interest in him may experience his environment as a stimulating, encouraging place through modifications. Spaces which are important to the person could be painted red, blue, yellow or any other color or combination of colors, with a change in the lighting, to alter his disposition toward the world. If color and light can be shown to be aspects of design worthy of major consideration, then they should not be treated as unitary and neutral stimuli. Bland hues and dim lighting often characterize the interior spaces of mental health centers, hospitals, schools, offices, and even homes, with a possible result that the spaces impart an unfeeling atmosphere. Knighton (1962a, 1962b) and Golwick (1962) argued that such neutral environments result in sensory deprivation for the person who has to live in them for prolonged periods of time. The individual, they contended, withdraws from the unstimulating effects of his environment.

Since the present study is exploratory, with little prior research to aid in selecting pertinent variables and sensitive measures, it is not necessarily expected that the findings may be directly implimented into circumstances beyond the laboratory; however, the study is a needed initial step in focusing more sharply on what occurs within the elusive area of individual-environment interactions.

Thus, it becomes clear that if environmental variables can be shown to influence our attitudes, feelings, and perceptual interpretations, then these effects are closer to being controlled--controlled by purposely prescribing color and lighting to arrange for or to meet specific needs and controlled in a non-manipulative manner, where simply cognition of the functions of the variables is sufficient to predict outcomes.

The second chapter of this thesis reviews literature pertinent to the study of the effect of color and light on the interpretation of emotional messages. There are four subject areas which logically bear upon the experiment under study. However, it is not possible to treat all four separately.

The first logical area is the effect of color and light in environmental situations on human behavior. The second and third areas are investigations of the emotional significance of color and of light. Finally, the fourth area is an examination of the validity and reliability of recorded voice communications.

Unfortunately, very few studies, as far as the present writer could find, isolated environmental variables or even recognized them; none was found to pertain to emotional behavior and its relationship to color; and no investigation found examined the emotional significance of light separated from color, e.g., achromatic illumination. The writer has chosen to discuss the literature which relates to the effect of the environment and relationship between color, light, and emotion under one category, since previous experiments and critical examinations handle them in unison.

A critical element in the study of the interpretation of emotional expressions, is to have some index of the validity and reliability of voice communications. If the receiver interprets emotional messages at random, regardless of experimental conditions, then there is no way to measure the effect of the environment on such interpretations. On the other hand, if emotional messages are interpreted in a consistent manner in relation to a standard, then there is a basis from which influences external to the interpersonal communication may be studied. Literature pertinent to the vocal and content elements of sound in emotional communications is reviewed.

CHAPTER II

REVIEW OF THE LITERATURE

Early experiments on color have been reviewed by Pressey (1921) and Norman and Scott (1952). Nearly all the studies included ignored the environment and discussed the color-emotion relationship in terms of color-affect or color-mood. Pressey concluded his review of the literature with the following analysis:

> (a) Introspective and observational studies show colors, as they appear in everyday experience to have a marvelous richness and complexity of an affective significance. There is the suggestion that color may be a conditioning factor of distinct importance in influencing the efficiency of mental work. (b) Laboratory experimentation for the most part fails to find any consistent relationship between color and either introspective evaluation or organic reaction. (c) Analytical and critical studies emphasize the importance of artistic conventions, symbolism, language and everyday association of certain colors to other sensations affectively toned, in giving an emotional connotation to the hues and brightnesses (p. 330).

Norman and Scott up-dated the review. Pressey's concern was with the effects of color on mental and physical activity. Norman and Scott, on the other hand, evaluated the literature in terms of the semantic meaningfulness of color and affect. The writers believed that all color experiments were logically reduced to two epistemological categories. First, experiments in which quantifiable measures are conceived in terms of previously established verbal terms, and second, experiments where verbal labels are conceived to describe empirical phenomena.

It is the difference between forcing associations to fit labels and descriptive terms and searching for labels and descriptive terms which adequately report a subject's associations or feelings. Thus, color studies are evaluated in terms of how accurately the assigned verbal association relates to the measured phenomena.

Color preference tests, according to Norman and Scott (1952), defined affect in terms of a "pleasantness - unpleasantness" continuum, thereby assigning the measured responses to a preconceived verbal relationship of the color to a label. The result was that the emotional effects of color remain unknown. The presumption appears to be that the continuum represented the experience of an emotional state. Actually, knowledge of the subject's feelings toward a color was not measured. What is known is the subject's choice on a scale as a result of a colored stimulus.

> The "affective value" of color cannot be measured in the sense of determining how much effect the color has on "mental processes." It is only possible to measure the effect of color on the subject's behavior...(p. 198).

The writers drew the same conclusion for experiments which attempted to behaviorally measure the relationship of color to emotion or to discover what verbal terms color connotes.

> Thus, while several studies have indicated an association of mood with certain color, no study bears directly on the perception of colors during certain moods (p. 199).

Color-Affect Studies

A paradigmic study of the affective value of color was conducted by Washburn (1911). Thirty-five women of college age were required to judge ninety colors along a numerical scale of pleasantness. Results indicated the order of affective value of the three dimensions of color (tint [hue], shade [lightness], and saturation)[1] is highest for tints, second for shades, and lowest for saturated colors. In addition, Washburn reported that the affective reaction to saturated colors is more positive than to shades and tints, and that the reaction to tints is more positive than to shades.

A study of the affective qualities of color, in the context of form, as cited by Norman and Scott (1952), was conducted by Hevner (1935), who reported that when different designs were matched with different colors and moods, subjects most frequently associated red designs with "happy" and "exciting" feelings, and blue designs with "serene," "sad," and "dignified." Hevner assigned the subjects' responses to preconceived categories. The responses were not free, because subjects were requested to choose appropriate descriptive words from a relatively short list.

Lewinski (1938) examined the relationship between color and affect, but included a consideration of the environment by studying individual responses to chromatic illumination. He used three scales: "pleasant-unpleasant," "stimulating-depressing," and "cold-hot." Lewinski discovered that colors, which are considered stimulating, e.g., red, orange, and yellow, were also chosen as warm or hot colors. Two colors, blue and green, were checked most frequently on the "pleasant" and "cold" sides of the respective continua. Purple was the only color which received a high level of agreement for the "depressing" side of the continuum.

The criticism of Hevner's study applies to Lewinski, namely, that his subjects were forced to assign their feelings to preset labels.

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[1] The writer has chosen to use the terms in Graham (1951) to differentiate color variables for surfaces, e.g., hue, saturation, lightness, transparency, and glossiness. This study is concerned with the first three variables.

Additionally, Lewinski stated that he felt that his findings tended to be insubstantial. He reported that circumstance, attitude, change in the environment, and learned associations over which the experimenter had no control, were contaminating variables. The importance of this study, however, lies in the fact that it is an early attempt to measure the affective qualities of colored lighting in the environment, and his self criticism applies to all experiments on color to greater or lesser degrees.

Color-Mood Studies

Color-mood studies typically focus on synesthesia experiments, i.e., experiencing sensations belonging to one sense or mode and associating them to sensations of another type. For example, Odbert, Karwoski, and Eckerson (1942) examined the question of how uniformly certain colors are associated with certain moods in musical selections. For at least a third of the subjects, associations of color and mood were made for the mood "sadness" with the color black, "tender" with blue, "leisurely" with blue and green, "playful" with yellow, "gay," "exciting," and "vigorous" with red. It is interesting to note that the color-mood associations chosen during the musical listening phrases of the experiment were the same as the phrase without music. Perhaps some relationships between moods and color are sufficiently strong to resist the influence of other variables.

Norman and Scott (1952) criticised Odbert et. al. for their attempt to force moods to fit a color circle. The experimenters superimposed one circle upon another to demonstrate the color-mood relationships; however, mixed color responses were omitted and the resulting relationships between the colors and the moods were imprecise.

A second criticism of the Odbert et. al. study was made by Wexner (1954) who felt that the word groups used contained adjectives, which in the eyes of many of the subjects, may not belong together. For example, the "playful" word list included "humorous," "whimsical," "fanciful," "quaint," "sprightly," "delicate," "light," and "graceful." Quite possibly, a subject may have felt that yellow was "humorous" and purple "graceful." Wexner chose a new set of word groups containing adjectives more similar in meaning, and presented subjects with eight colors and a list of eleven mood-tone groups. Results showed that for each mood-tone, certain colors were associated with that mood-tone significantly more often than other colors. The observed color-mood associations were red with "exciting" and "stimulating;" blue with "secure," "comfortable," "tender," and "soothing;" orange with "distress," "disturbed," and "upset;" purple with "dignified" and "stately;" yellow with "cheerful," "jovial," and "joyful;" and black with "powerful," "strong," and "masterful." Upon inspection, it appears that the clusters of words chosen for each color are more closely allied in meaning than the clusters chosen by the subjects in the Odbert et. al. study. However, there is no measure of how closely two or more words mean the same thing for either of these experiments.

The constant color-mood relationships for Odbert et. al. and Wexner are only in agreement with the primary colors (red, blue, and yellow). Quite possibly, only the primary colors have general and enduring mood associations, and the other colors have generality eluding qualities, i.e., they are subject to personal and ephemeral associations.

Murray and Deabler (1957) repeated Wexner's (1954) study but included subjects who represented different socioeconomic positions, mental health classifications, and geographical regions. Wexner used only college students as subjects. The basic procedure of Wexner's method was otherwise unchanged.

The experimenters found that the color-mood associations established in Wexner's study were subject to change when differential socioeconomic populations were sampled. A change of less magnitude was reported when populations from different mental health classifications and geographic regions were investigated. Also reported was that some colors were consistently associated with specific moods for all the groups tested. For example, blue and green were associated with "secure," "tender," and "calm;" red was associated with "exciting," "cheerful," and "defiant;" brown was associated with "protective;" purple was associated with "dignified;" and yellow was associated with "cheerful."

The value of the findings of the experiment is limited, because certain groups demonstrated a response bias for a color regardless of the mood-tone connotation presented, and because the results apply to only one shade of each color.

Ross (1938) similarly attempted to measure emotional relationships to colors. The importance of his study is that color was investigated in a larger, more familiar environmental setting--a theatrical stage. For each arrangement of colored lighting on stage, he asked the subjects to scale their reactions on several dimensions of descriptive adjectives, one of which was an emotionality rating. Ross' conclusion agreed in part with Pressey (1921), whose experiments on the effect of color on mental and motor efficiency showed that brightness, more than hue and saturation, influenced behavior. Ross reported that "irrespective of hue, the results indicated that high brightnesses are associated with hot, active, and comic scences, whereas low brightnesses are associated with emotional, tense, tragic, melodramatic and romantic scenes" (p. 183). Unlike Pressey, Ross found the effects of saturation and brightness were independent. "High saturation, on the other hand, goes with scenes which are emotional, tense, hot, comic and melodramatic" (p. 183).

Ross' method, where a series of adjective lists are given to subjects in order to study the affective properties of color, pertained no more to emotions as they are behaviorally experienced than previous studies. Ross never presumed that his data indicated other than a conscious association, but there is nevertheless the realization one gets from a survey of the literature of a need for a study which investigates the relationship between color and emotion in an unobtrusive manner employing behavioral measures rather than introspective evaluations.

A more comprehensive adjective list was compiled by Schale (1961). He used the "constant sum method," which requires a judge to indicate the relative magnitude of two stimuli. The approach stems from the method of paired comparisons. The judge has no opportunity to vary the stimuli.

He simply compares one stimulus to another along some scale, e.g., tension, warmth, etc. The association between eleven adjective mood descriptions with ten colors was rated by professional judges. His results showed a differential strength of association which depended upon specific colors with mood-tones. He found the same for the strength of association between different colors with one specific mood-tone and different mood-tones to one specific color. A criticism which applies to Ross' and Schale's experiments is that there was no control over how many different words may be used to describe an affect of color.

Color-Connotation Studies

With the inception of the Semantic Differential scale (Osgood, Suci, and Tannenbaum 1957) another method become available for the measurement of color affect and color meaning. The usefulness of the scale and the factor analytic method of investigating the connotative meanings of color was demonstrated by Wright and Rainwater (1962). Their aim was to learn more of the relationship between perception and connotation.

The subjects were middle and lower class men and women in urban West Germany. The five largest components of connotative relationships of color to meaning were computed and accounted for eighty per cent of the variation in a 48 by 50 matrix. No real "cluster" of adjective-pairs was overlooked, according to the experimenters. The connotative nature of the five components was characterized by the experimenters as "hapiness," "forceful-strength," "warmth," "elegance," and "calming-strength." Six clusters of adjective pairs were identified from the five components. The first cluster, "happiness," contained significant loadings on descriptive adjectives as "happy," "young," "fresh," "clear," "social," and "graceful." The second cluster, "showiness," had significant loadings on the adjectives "outstanding," "showy," and "exciting." The third cluster, "forcefulness," and significant loadings on the adjectives "strong" and "forceful." The fourth cluster, "warmth," contained the adjectives "warm," "full," and "healthy," The fifth cluster, "elegance," was defined by "splendid" and "elegant." And the final cluster, "calmness," was associated to the "calming" side of the "calming-exciting" dimension and the "strong" side of the "strong-weak" dimension.

The importance of finding these clusters was for the experimenters a way of operationally answering the question: What, then, are the linear effects of hue, brightness, and saturation for the six dimensions of color connotation? Another important aspect of the study is that by using a factor analytic method, attempts to label the phenomena did not come until the data were gathered.

The results showed: (a) The connotation of "happiness" was dependent upon brightness and that saturation had to be increased for increased "happiness" connotation. (b) "Showiness" and "forcefulness" were found only with increased saturation. (c) "Warmth" connotations increased with a decrease in color wave length (increase in redness). (d) "Warmth" connotations increased with increased lightness and saturation. (e) "Elegance" connotations increased with the blueness of the hue. (f) Increased saturation affected connotations of "elegance." And finally, (g) The combination of "calming" and "strong" depended mostly upon saturation level and partly on the increased blueness of the hue.

Wright and Rainwater confirmed some of the previous findings of Ross (1938), Wexner (1954), and Murray and Deabler (1957) in showing that hue connoted warmth, activity, and excitment when it approached the red side of the color spectrum. Ross' results, in particular, were supported by the data showing that increased brightness corresponded positively with passivity and coolness. Additionally, the data showed that increased saturation corresponded positively with impressions of warmth, activity, and strength.

Wright and Rainwater have attempted to show the influence of color in terms of linear functions, but their results only supported a linear model in part. There are discrepancies. For example, the linear effect of hue was found to be insignificant. One gets the impression that the investigators overstated the case. It is clear that their model does not account for all of their findings, in addition to which, studies by Warner (1949), Washburn (1911), and Guilford (1934) present evidence which does not support a linear function. It appears that more data are required to produce a comprehensive and accurate description or model of color affect and color meaning.

A second comprehensive study of the meaning of color was by Black (1965). One hundred subjects viewed 20 colors and 18 words and rated them on Semantic Differential scales. The experimenter was concerned with the degree of similarity of words to colors and, more particularly, words which are used to describe colors, words which have emotional meaning and are often attached to colors, and words which are used to name colors. Results showed that the descriptive and moods terms, e.g., "advancing," "angry" respectively, did not have meaning which is similar to that of the colors studied; whereas the terms used for naming a color ("red," "blue," etc,), were found to have a high degree of similarity to the colors themselves.

The preceding experiments have focused on the emotional meaning of color. In both experiments, the associations between color and mood, if not completely forced, made the subject aware that he was to relate color and mood. An important question to be investigated is whether the emotional significance of color remains the same when the subject is unaware of color as a potentially interacting variable. The question is an essential part of the present experiment and is discussed in greater detail later.

Sex Differences in Color-Affect

Experiments intent upon answering the question of whether there is a differential response to color between the sexes have yielded conflicting data. Norman and Scott (1952) cited several studies which reported sex to be an insignificant color preference determinant. On the other hand, Warner (1949) argued that there are sex differences in preference. Unfortunately, the primary purpose of Warner's investigation was to learn of differences in preferences between mental health classifications. Hence, his population consisted of abnormal subjects. Nevertheless, his findings indicate interesting and possible meaningful trends. Recording preferences along the scales of hue warmth, lightness of hue, and hue saturation, he reported that men prefer cooler hues more than women. Also, when comparing the darker hues to the lighter hues on the lightness scale, men prefer the darker hues more than the women. And finally, men prefer the darker hues when the meduim hues represent the dark side of the lightness scale more than the women.

Warner's data are mildly discrepant from those of Guilford (1934), who reported that the affective value of colors is determined largely by hue, and to a small degree by saturation and lightness. In Guilford's study, 67% of the women and 16% of the men indicated that hue determined a color's affective value, 20% of the women and 5% of the men indicated that the lightness of the color determined its affective value, and 5% of the women and 13% of the men indicated that the more saturated colors determined the affective value. Guilford's model, however, is based on an investigation which used a more normal population of much less magnitude (five men and five women).

The problem implicit in the above studies, as in all preference studies, is that preference may not be a valid index of color-affect. Even though there may be sex differences in preference--and this is still inconclusive--it is important to know whether men and women behaviorally react differentially to hue, saturation level, and brightness of color.

Physiological Measures of the Effect of Color

If the human organism reacts to color, what physiological changes accompany the reactions? The present writer could find only one study which attempted to measure physiological responses to changes of color in the environment. The effort represents a strong blend of pioneering and rigorous research. Gerard (1958) investigated color-affect at the physiological level as well as eliciting verbal descriptions. The verbal reports associated particular feelings with red, blue, and white illumination, which support previous studies, but with the conscious associations, the experimenter recorded physiological activity during exposure to each color condition and found reactions which involved much of the body.

> Systolic blood pressure, palmer skin conductance, respiration rate, and frequency of eye blinks were significantly lower during the blue than during red illumination. Intermediary levels were obtained with white light. Alpha waves from the visual cortex were present for a significantly greater percentage of time during red stimulation, indicating less cortical arousal during blue illumination (p. 2).

Physiological measures in general are subject to risk when used as the basis for interpreting causes of behavior. Such measures are in reality correlations of one behavior pattern with another (the subject's response to instructions). Yet, the physiological behavior recorded in Gerard's study has great significance, because his results weaken the often presumed hypothesis that color-affect may be treated as a unitary stimulus of minor influence, i.e., an independent variable, which, in the planning of experiments or physical spaces, contains affective properties of insignificant effect. Color, Gerard showed, stimulates much of the body processes, and different behavior patterns are observed from exposure to different colored lights. His data support in part the theory that as a person moves through his environment and experiences various colors, he reacts differentially to them.

Subjective measures in Gerard's study showed the following:

> Different colors elicited different feelings and attitudes, as reported by the subjects at the end of the experiment by means of rankings and ratings. Overall color effects were significant in 22 out of 30 analyses of variance by ranks. Based on sign tests, statistically significant differences included: (1) greater overall well-being, greater relaxation and calm, more pleasant ideation, and less anxiety and hostility during blue than during other illuminations; (2) increased boredom during white illumination; (3) more tension, excitement and arousal during red stimulation (p. 2).

In the final examination, Gerard's study, by indicating that different colors do different things to persons, touches upon the importance the environment plays in the examination of the nature of color-affect. Unfortunately, the study requires more precise measures on the relationship between color and emotion before specific relationships can be evaluated. The experimenter looked for the effect of color on emotional arousal. In addition, he might have examined how the arousal was interpreted. Gerard was satisfied to report that subjects experienced pleasant sensations under the blue light and did not examine which emotions, if any, were experienced. The present writer's argument, here, is that sensation does not necessarily represent an emotional experience. Perhaps some of the colored light resulted with a flat affect more than others. Similarly, under the white condition, he found increased boredom, and under the red condition, increased sensations of hostility and anxiety. Gerard's data suggest that emotional reactions interact with color and light, and he had an opportunity to record the effects of color on emotions more precisely, (but chose to ignore it).

To generalize about Gerard's results requires caution for three reasons. First, he exposed his subjects to an experience which, in all likelihood, was unusual for them.

> The subject was seated in a darkroom, surrounded by black materials. His head rested on the back of a comfortable armchair. Three colored lights, namely blue, red, and white...were projected upon a translucent screen directly in front of the subjects for periods of ten minutes each (p. 1).

A second consideration in Gerard's study is that he presented the color stimulus in a manner that made the independent variable apparent to the subject. It appears that no study has successfully measured the influence of color without the subject's cognizance that color is being investigated. Traditionally, experimenters have attempted to elicit responses at a subjective level, focusing directly on color as a stimulus alone or in combination with other stimuli. Additionally, one gets the impression that in previous studies the color stimuli tend to be intense, especially in the colors studied which measured behavior without recording the subject's impressions. Whatever qualities are required to give a measurable color response are typically there in large quantities. Humans may have differential reactions to subtle changes in color stimuli, e.g., to colors experienced daily.

A third consideration is that no study has attempted to measure the influence of color as we ordinarily experience it, in the form of painted hues, and as an integral part of the environment.

A final consideration is that Gerard kept his light intensities and saturation levels constant. If light were systematically varied with color, then the results would again be more applicable to human behavior and its relationship to color, because color-affect is a complex and various phenomenon, and it would be to our benefit to maximize opportunities to investigate interactions between several variables.

Conclusions of the Value of Color Studies

From the foregoing survey of the literature, it becomes clear that there is limited knowlege of the relationship between color and emotion especially when the context in which the stimuli are presented is varied.

Pressey's (1921) conclusions still apply.[2] Colors have a "complexity of affective significance," and consequently, much of the data conflict, and none of the data touches upon either the emotional states experienced during exposure to color stimuli or to possible influences the stimuli may have during such emotional experiences.

Primary colors seem to have qualities which may be generalized to the public, e.g., red is ofen related to feelings of excitement, warmth, activity, and other arousing influences; blue is usually related to feelings of serenity, sadness, mellowness, tenderness, comfort, and other relaxing experiences; yellow is frequently (but not as consistently as the responses for red and blue) associated to two kinds of feelings, those of happiness, cheerfulness, and joy, and those of disgust and fear. The latter feelings attributed to yellow are based upon the historical research by Ellis (1900, 1906) and Birren (1952, 1955, 1959, 1961); and white, which technically cannot be considered a primary color, may be associated with purity (Birren, 1961) or boredom (Gerard, 1958). The data on the responses to other colors tend to suggest that the effects are either highly individual or ephemeral, possibly both, because the results are inconsistent not only across studies, but when the same study is repeated (Lewinski, 1938; Karwoski, and Eckerson, 1942; Wexner, 1954; and Murray and Deabler, 1957). Again, data on differential preferences between sexes conflict with results from Norman and Scott (1952) who reported studies where sex is not a significant independent variable, and Warner (1949) and Guilford (1934) who reported significant differences.

Measuring the affects of color separated from context is difficult and may be valueless, because data gathered from preference studies are easily changed simply by attaching a frame of reference against which a person judges. The environment, as a frame of reference, is important. The writer feels that color research conducted without the environment in mind contains little application to considerations of color within environments. Unfortunately, contexts of colors on our surroundings vary to such an extent that is is difficult to extrapolate the results of one study to another, even when the environment has been considered and controlled to some extent. Gerard's (1958) work represents a good example of the inability to relate his research work to other situations. One may make several inferences from his results, e.g., blue surroundings might be used as a relaxant, red might be useful in arousing persons troubled with reactive depression or exhaustion. However, the intensity of the stimuli and the attention-arousing characteristics of his study preclude meaningful extrapolations to other environments, e.g., the circumstances under which the present writer conducted his experiments. An experiment which might permit generality beyond the specific conditions of the laboratory would be one in which the stimuli did not significantly differ from the kind of stimuli people encounter under typical environments, e.g., using commercial hues and standard light. A further value of such laboratory conditions is that the subject would be less likely to notice color and light as independent variables since he finds them commonly in his daily experiences.

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[2] Pressey's breadth of interest and thorough manner have made him a precursor in many areas. For example, because of his early efforts in the field of education and his concern with teaching aids, he is frequently referred to as the "father of teaching machines."

Research on the Perception of Communicated Emotions

Thus far, the discussion has focused on the association of colors to mood with particular emphasis on emotional reactions which color may arouse. None of the experiments has investigated the effects of color or light on how one individual perceived the intended emotion from another individual. The importance of such an investigation is that it is not only possible for the physical environment to create emotional climates, so that the individual has a specific emotional response, but additionally, the intended communication between two individuals may be altered sufficiently, so that the receiver interprets the sender's meaning to be different from what was intended.

To investigate intended communications, it is necessary that specific emotional states be reliably portrayed. Hence, only the interpreter would vary from one communication to the next.

The question of whether a voice as an isolated auditory element can communicate anything through a recording has been investigated. Gates (1927) found the phonograph feasible for communicating a speaker's emotional state, e.g., happiness, unhappiness, anger, fear, surprise, scorn, defiance, pity, and suspicion, but the accuracy of the listener's judgment depends upon the listener's intelligence and educational level. Allport and Cantril (1934) showed that listeners could choose above a chance level the speaker's age, personality sketch, and photograph. Fay and Middleton (1939, 1940a, 1940b, 1941, and 1943) conducted several studies to determine which physical and mental conditions of speakers could be reliably communicated through voice recordings. The investigators achieved limited success in having the listeners judge the speaker's occupation, sociability, and intelligence, and virtually received random judgments for leadership qualities and whether or not the speaker had any sleep prior to his recording.

Allport and Cantril used Sapir's distinction of form and content in voice to their analysis of speech. Sapir noted that the voice communicates with vocal qualities as well as speech content. Thus, a method has to be devised which could treat the form and content of the speech as separate variables.

Three methods have been developed to measure how reliably nonverbal parts of the voice convey emotions. Kramer (1963) referred to the three methods as the presentation of verbal stimuli which are of (1) meaningless content, (2) ignored content, and (3) constant content.

Meaningless Content

An example of the first method is Dusenbury and Knower (1939). The investigators used phonographic records which contained the attempts of students to record the form of an emotion with an ambiguous content, i.e., to express the vocal quality of an emotion by stating an alphabetical letter from A to K. Eleven emotions were expressed, four of which were anger, glee, sadness, and fear. Recitations were selected from pretest performances which were matched with the intended emotion of the speaker by a group of listeners. The investigators concluded that one may accurately communicate qualities of emotion with a tone code of meaningless content.

An additional variable of voice is its sound frequency pattern. The listener may judge on the basis of hearing higher or lower frequencies of speech. Knower (1941) controlled for frequency patterns in voices by having the speakers whisper alphabetical letters, thus keeping the frequency of the voice sound waves below a particular level. He still found successful recognition of the intended emotions.

Whispering the contents may adequately preclude higher frequencies, but it seems likely that, by asking the speaker to distort his mode of expression, the listener will receive a communication which does not reflect the typical manner in which he hears an emoted item.

Ignoring Content

The method of ignoring content focuses on the measurement of non-verbal parts of speech. Expulsion rate of syllables and rate of respiration are typical indices. The concern for controlling the sound frequency of voice is in this case resolved by making an ordinary recording and subjecting it to a filtering process, which reduced the amplification of speech until the voices are too low for the listener to be certain of the speech content. It is difficult to determine how the investigators intended the listeners to interpret the verbal stimuli. The subjects were not supposed to understand the contents, yet, the contents contain elements which would lead the subject to infer that behind the camouflaging device there is meaningful content. The experience of the subject, if one may conjecture on the investigator's unwritten intent, seems to be judging contents with vocal meaning and unclear speech contents. On the other hand, a listener may find the clouded passage to be of meaningless content; another listener may understand part of it; and a third may understand a good majority of it. It is important, when measuring interpretations of expressed emotions, to know how the subjects interpret the nature of the stimuli, and how much of it he understands. A subject's understanding of the filtered tape (vocally and speech content) may not be significantly less than his understanding of the unfiltered passages.

Starkweather (1956) filtered out content from the 1954 Army-McCarthy hearings by attenuating the higher frequencies. Later, the same judges listened to the unfiltered recordings. The investigator concluded that "a comparison of the categories assigned to the filtered and unfiltered recordings indicates that Welch's voice was judged to be without variation" (p. 401).

It must be realized that feelings about McCarthy were strong, and the listener's judgment, especially if he recognized the speakers, would probably be influenced by his opinion of McCarthy or Welch. Hence, Starkweather may have received judgments on the respective protagonists rather than on any particular emoted phrase.

Soskin and Kauffman (1961) provided experimental verification that voice sounds without semantic components of vocal messages carry clues of the emotional state of the speaker. Fifteen speech samples were rated for emotional content by listeners, who judged the samples from normal recordings, and by other listeners who listened to a recording with frequencies above 450 cycles per second deleted. Thus, the method of ignoring content has been shown to have validity in testing human responses to emoted passages.

Constant Content

The method of communicating all emotions through contents which are constant for all the speakers, uses the same phrase for all expressed emotions. The phrase is ambiguous insofar that its content does not logically apply to any emotion, except perhaps to "indifference," yet the emoted words contain meaning whereas alphabetical letters do not. Fay and Middleton (1939, 1940a, 1940b, 1941, and 1943) used one passage and varied the conditions of the speakers to see if listeners could asses differences in the speakers.

Fairbanks (1940; Fairbanks and Hoaglin, 1941; Fairbanks and Pronovost 1939), as cited by Kramer (1963), used actors to read five passages with five emotions. Listeners were instructed to identify the portrayed emotions. Kramer (1963) reported in an unpublished study that he found the passage used by Fairbanks et. al. to be non-neutral. Rather, the content of the passage was most readily associated with anger.

Miller (1966) in an unpublished dissertation used a tape recording which he and other members of the Clinical Psychology Program at the University of Utah developed, to discover which of 53 variables (age, sex, birth order, 18 scales of the California Psychological Inventory, four scores derived from the Shipley Institute of Living Scales, and 14 scores derived from the subjects' responses to a standardized tape) influenced the accuracy of decoding the emotional meaning intended. The tape Miller used was also used by the present writer as the verbal stimuli in his experiment. The method used to create the tape is described in the fourth chapter.

A comparison of Methods

One study (Kramer, 1964) examined experimentally the three methods of investigation of the relationship between nonverbal parts of speech and the listeners' judgments of the speaker's emotional state. The investigator used the same subjects as their own controls for the three conditions. Spoken Japanese was used for the meaningless contents part. Five emotions were studied: anger, contempt, grief, indifference, and love. Kramer found that with a constant verbal content, the portrayed emotions were frequently judged as the actor intended them. The most frequent confusion of judgments was between love and grief. The percentage of judgments which placed each actor's portrayals in the intended category ranged from 56% to 85%. Kramer described the range as a typical variance in one's ability to communicate an emotion consistently as well as one's ability to interpret each emotion with consistent ability. It would seem that the variance in communication between the speaker and the listener, either by speaking the same emotions over again or by hearing the same recording at a later time, is due to something other than the change in either the speaker's or listener's physical state or use of perception mechanisms. Perhaps the varience is due to fluctuating influences within the listener's surroundings. From the available data, there is no way of assessing such an influence. However, such a study would be desirable.

The filtered speech condition which was used when the contents of speech were to be ignored, showed similar patterns of the first condition with the additional significant errors that contempt was being mistaken for indifference. A comparison was made between judgments during the unfiltered and filtered English phases, and the investigator found that subjects were able to judge emotion accurately under either condition.

Kramer, as others (Starkweather, 1956; Soskin and Kauffman, 1961), found uncertain criteria for eliminating intelligibility of speech. The investigator reported that subjects were not able to recognize speech content upon the first listening session, but nearly all felt they understood the contents after several sessions. Kramer was faced with the problem of lacking an adequate measure of intelligibility of unfiltered speech.

Foreign speech, used as the stimulus for the method of meaningless content, permitted accurate judgments of emotions. The most frequent error was to mistake love for indifference more often than love was correctly judged.

One difficulty with using a foreign language for meaningless content, especially with the use of actors who speak it as their native tongue, is that different nonverbal cues from English may be used. Hence, the listerers, even if they are capable of recognizing a vocal change in the actor's voice, may still lack clues as to what emotion is being expressd.

Conclusion

The preceding survey of literature on experimental attempts to measure success in communicating vocal qualities and speech content in voice has shown that various conditions of the speakers can be accurately decoded. For this reason, it was considered possible that a recording of emotions could be successful in reflecting conditions of the listeners. Responses to taped stimuli across several experimental groups in separate environments would be recorded to look for differential response patterns across the experimental groups.

CHAPTER III

THE PROBLEM

The literature review revealed some unanswered questions concerning research on color. They are: (1) Can behavior recorded along one dimension [judging emotional communications] be quantitatively related to another dimension [color/light effect]? If so, can one measure be sensitive enough to show differences across environmental conditions? (2) Are color-mood associations, as cited in the literature, relevant to other kinds of color-mood responses, e.g., when the experimenter deliberately avoids focusing the subject's attention on the relationship of color in the environment to interpretations of mood portrayals? (3) Can meaningful effects of the environment on human behavior be obtained within a standard of 33 minute testing session?

Of particular concern in the present experiment is a yardstick for measuring possible effects of environmental factors as human behavior. The physical environment may or may not effect perception of emotional states. The intention is to find a measure sensitive enough to show environmental effects, should they exist. The present experiment answers the criterion problem by requesting individuals in a particular situation to judge stimuli along one dimension (rating the intensity of an emotional communication) while the experimenter recorded subject behavior (judging) as it relates to other dimensions (exposure to different environments of color and light).

Does a single measure severely limit the opportunities to observe environmental influences? Several criteria might allow for a more sensitive measure of environmental effects. The present experiment contains one dependent variable for pragmatic reasons--in spite of the disadvantage of being less likely to find significant results. It was felt that since little experimentation has occurred which relates the individual to his environment, it would be wise to explore the field in a simplified manner initially, and to expand upon the experimental approaches with subsequent investigations.

The second concern is whether the results will meaningfully relate to previous experiments in the area studied. An essential difference between the present approach and previous approaches, which has already been mentioned, is that a precaution was taken to insure that the individuals in the experiment are unaware of color, light or the environment as being an important part of the experiment. Each subject's lack of cognizance was established by asking him to describe what the purpose of the experiment was. Table I lists previous research on color as it relates to the current problem. The experimental conditions from which the data come vary greatly from the present experiment. Also, because the data were often tabulated for general mood categories, e.g., excitation,

Table I

Data from Previous Research Related to the Present Experiment

Researcher	Pertinent Findings
Ellis (1900, 1906)	Red is Associated with Anger Yellow is Associated with Fear
Washburn (1911)	Dark Hues are Associated with Happy
Hevner (1935)	Red is Associated with Happy Blue is Associated with Sad
Lewinski (1938)	Bright Chromatic Lighting is Associated with Happy
Ross (1938)	Bright Chromatic Lighting is Associated with Happy Dim Chromatic Lighting is Associated with Sad Red is Associated with Anger Blue is Associated with Sad Yellow is Associated with Happy
Odbert, Karwoski, and Eckerson (1942)	Red is Associated with Happy
Wexner (1954)	Yellow is Associated with Happy
Murray and Deabler (1957)	Red is Associated with Happy Yellow is Associated with Happy
Gerard (1958)	Red is Associated with Flirting
Wright and Rainwater (1962)	Dark Hues Are Associated with Happy
Birren (1961)	Dark Red is Associated with Anger Light Blue is Associated with Fear and Sad Light Yellow is Associated with Happy
Black (1965)	Dark Red is Associated with Flirting

Note.--All of the above findings stem from investigations in a western society. It is recognized that cultural differences in regard to color reaction exist and therefore the results stated above might not hold up in a broader study of cultural settings.

relaxation, pleasantness, rather than for specific emotion categories, e.g., fear, anger, indifference, the findings can only be related to the thesis in a loose fashion; however, they can serve to generate expectations for the present experiment.

The final question of whether meaningful results can be obtained within a 33 minute session is handled by the treatment of time as an independent variable. Construction of the physical environment tends to last. Our initial reactions to a given setting may be negligible, but through time our feelings, attitudes, and behavior may take on various patterns as a result of prolonged exposure to the setting. Changes in behavior over units in time is one area of environmental research which has been investigated very little hence, in the present experiment, the testing session was examined in terms of differential responses over successive 11 minute periods.

The statistical model used in the present experiment (a factorial analysis of variance design) seeks global differences between individuals varying several independent factors. Whether it can be shown that the environment plays a significant role in affecting behavior is not as important as discovering how the independent variables relate to one another under specific circumstances. The findings in Table I serve as a guide to examine specific relationships between the variables under study. The data in the table are the background for the hypotheses in this study.

In summary, the aim of this thesis is to conduct an exploratory study to measure possible differences in the interpretation of emotional expressions as a function of painted hues and intensities of light. The experimental conditions differ from previous research in five ways:

(1) Several studies have indicated that color arouses emotional reactions, but no study has sought the effects of color on the interpretation of expressed emotions.

(2) One study (Gerard, 1958) measured the effect of hue in a room with colored lights; however, no study has attempted to measure the influence of painted hues in identical spaces.

(3) No study has measured the effect of color and light either individually or in combination without the subject's knowledge of them as independent variables or variables of importance in the study.

(4) Much research has been conducted on the effects of illumination in a room, but no study has systematically varied achromatic lighting to seek out the emotional significance of illumination.

(5) Few environmental studies have included time as either an independent or dependent variable.

The Hypotheses

The specific hypotheses tested in the experiment are:

(1) The judged intensities of emoted phrases differ significantly across varying combinations of color and light for all six emotions.

(2) The judgments assume the following patterns:

a. The mean judgment of the emotion *anger* increases significantly over the mean judgments of the other emotions under the conditions of a *red room* and a *yellow room* (illumination level "bright").

b. The mean judgment of the emotion *sad* increases significantly over the mean judgments of the other emotions under the condition of a *blue room* (illumination level "dim").

c. The mean judgment of the emotion *happy* increases significantly over the mean judgments of the other emotions under the conditions of *dark hue lightness and medium lightness room* (illumination level "comfortable").

d. The mean judgment of the emotion *fear* increases significantly over the mean judgments of the other emotions under the condition of a *blue room* and a *yellow room* (illumination level "dim").

e. The mean judgment of the portrayal of *flirting* increases significantly over the mean judgments of other portrayals under the condition of a *dark red room* (illumination level "dim").

(3) The mean judgment of each emotion differs significantly between male and female subjects.

(4) The mean judgment of each emotion differs significantly with increased exposure of the subjects to the varying conditions.[3] (The judgments, which take 33 minutes to obtain from each subject, are analyzed in terms of three sequential time periods: (a) judgments of the first 68 phrases, (b) judgments of the second 68 phrases, and (c) judgments of the last 68 phrases.

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[3] Admittedly, this experiment deals with short range effects. Nevertheless, to investigate effects over time has value. The importance of time and questions related to it as a variable are discussed in Chapter VI.

CHAPTER IV

METHOD

The experiment was divided into two parts. First, a pilot study was made to establish the final levels of each independent variable. Second, the main experiment was conducted.

Pilot Study

Subjects

Twenty-seven students from Psychology 5 classes at the University of Utah were divided into three groups of nine subjects each. For the preliminary investigation, there was no attempt to control for sex. Hence, the pilot population was composed of 17 men and ten women. The male age ranged from 18 to 46 years with the average being 21.6 years, while the female age ranged from 18 to 44 years with the average being 22.3 years. Of the sample, 19 were freshmen, 6 were sophomores, and 2 were juniors.

Conditions (Controlled Variables)

Four identical and adjacent ten foot square rooms on the west bank of the second floor of Bridger Hall were painted. The floors had a natural-stained finish, and the ceiling was part flat and part sloped. The flat part, which was 8'-0" high, spanned 6'-3" from the east wall toward the west wall. The remaining 3'-9" span of the ceiling to the west wall sloped from 8'-0" to 7'-2" in height.

The overhead light source was a portable four tube fluorescent fixture whose brightness could be controlled by a light rheostat.

Objects in the room were five black canvas chairs facing south, one clip board for each chair so the subjects could have a hard surface to mark their responses, one pen for each clip board, one thermometer placed in the northeast corner, and one speaker hidden from view in the ventilation space above the ceiling on the east wall.

The door to each room was on the east wall and remained closed during the testing session. The door's inside was painted the room color. The window in each room on the west wall was blocked out completely with Celetex board from the ceiling to the floor for light control. The window cover was also painted the room color.

Procedure

Room Color (Independent Variable). The hue of the room (red, blue, or yellow) was one independent variable. For each hue, three lightness levels (dark, medium, and light) were selected and manipulated independently of hue.

The colors were selected from Colorizer Paints Album of Bennett's Paint and Glass Co., Inc., Salt Lake City, Utah, because of their high commercial use and wide distribution. It was felt that the colors used in the experiment should be the same ones made available to the public. The three lightness levels of each hue were chosen from a scale of increasing amounts of white added to a mixture of Colorizer colorants. The lightness levels were taken from positions of approximately equal distance from one another in terms of proportioned mixture of white to the colorant.

In order to relate the Colorizer colors to color systems used in other color experiments, close equivalents to the Colorizer samples were found in the Ostwald Color Harmony Manual, published by the Container Corporation of America. Table 2 lists the Colorizer colors used in the experiment and their near equivalents to the samples in the Ostwald system. These colors represent the final hues and their lightness levels arrived at through the pilot study and used in the main experiment. It is important to note that these levels were arbitrarily selected by the experimenter and are fixed.

Saturation levels in the color samples were mixed with hue and lightness level because the Colorizer Paints Album did not offer separate saturation values for each lightness level of the hue.

An additional characteristic of the nine color samples (three hues and three lightness levels for each hue) is that they do not represent the darker side of the lightness scale. Hues with increasing amounts of black in them have little commercial value since they are rarely used in great quantity. Hence, the Colorizer system lacked any consistent pattern of color mixture for the darker hues. Figure I shows a diagram which is frequently used to describe the relationships of color variables to one another (Osgood, 1953).

Light Stimuli (Independent Variable). The subjects of the pilot study were divided into three subgroups of nine persons each. The subjects in Group I were instructed to "adjust the rheostat so that the room is at a bright comfortable level." Subjects in Group II were instructed to "adjust the rheostat so that the room is at a comfortably lighted level." And subjects in Group III were instructed to "adjust the rheostat so that the room is at a dim comfortable level."

Since it was impractical to assign subjects at random to 27 rheostat levels (nine "bright comfortable," nine "comfortably lighted," and nine "dim comfortable"), the order of the 27 rheostat levels were randomized, and the subjects were assigned to a given rheostat level in the order in which they appeared.

Each subject entered the room with the experimenter. The experimenter instructed the subject to adjust the rheostat. The subject was

Table 2

Colorizer Paints Album Color Samples Arrived at in the Pilot Study and Used in the Main Experiment with Their Near Equivalents to the Ostwald Color Harmony Manual

Colorizer System Number	Near Equivalent Number in Ostwald System
Red	
IF 49	Hue 7 1/2 - na
ID 25	Hue 6 - ga
IB 1	Hue 8 - ca (slightly darker)
Yellow	
7E 43	Hue 2 - pa (slightly darker)
7E 25	Hue 2 - ga
7B 7	Hue 1 1/2 - ca
Blue	
20C 49	Hue 15 - na
20B 25	Hue 15 - ga
20A 1	Hue 16 - ca (slightly darker)

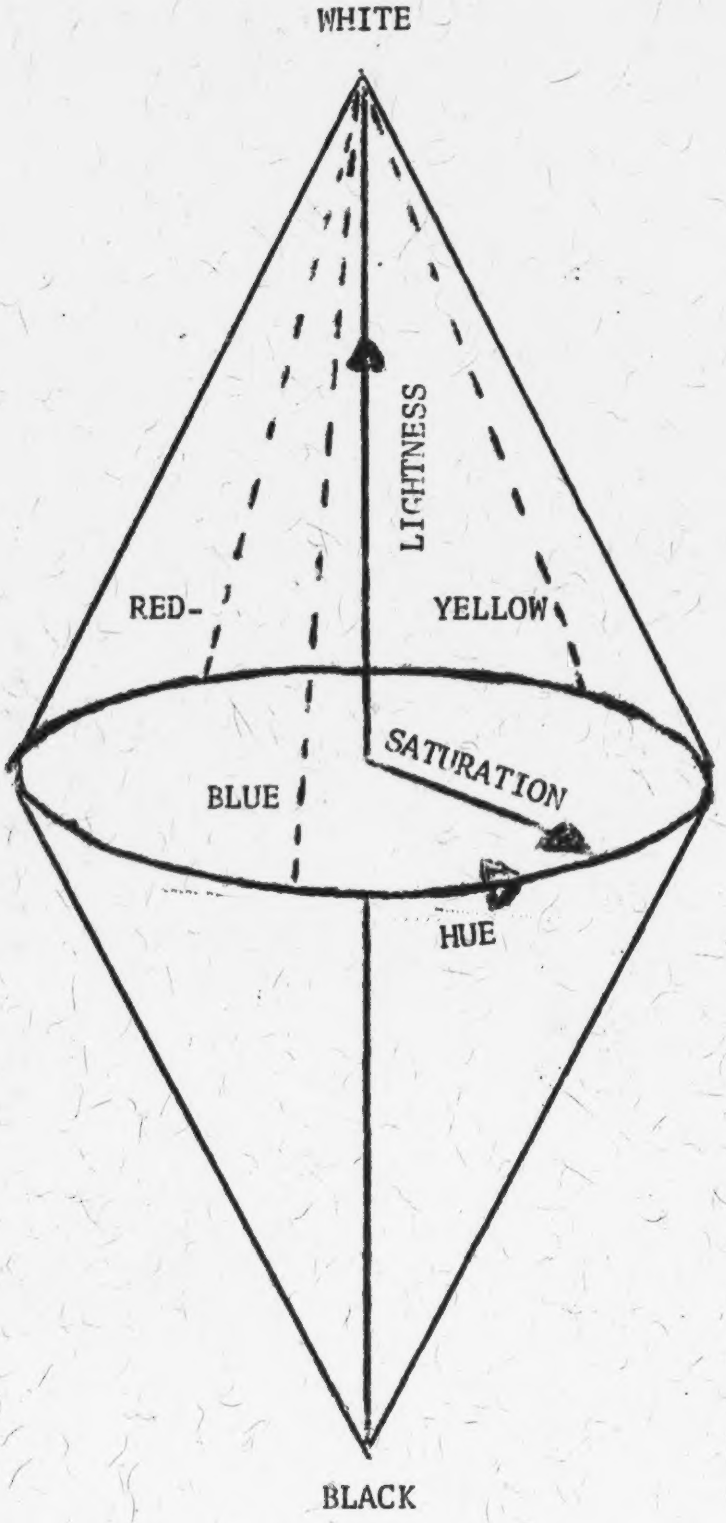
WHITE
LIGHTNESS
RED-
YELLOW
SATURATION
BLUE
HUE
BLACK

Fig. 1. Typical color solid. Lightness variations are represented along the vertical dimension, hue variations around the horizontal circumference, and variations in saturation as distance from the axis.

then asked to leave the room and wait in an area separate from the room where subjects, who had not been run, were waiting. The use of the extra room helped keep the individual judgments independent.

The experimenter then measured the wall reflectance value of the light level chosen with a Gossen Lunasix light meter. The readings were taken from a measured 2'-0" distance from the center of each wall and 3'-0" above the floor. The readings obtained are listed below for each light level, first according to the Gossen scale and then in terms of translations of the scale into foot candle units (Table 3). For each group of subjects, a median choice of the nine judgments was computed, which established three intensities of light.

Two problems occurred during this phase of the preliminary experiment. First, readings were only taken in a Dark Red Room. It was felt that because of the light absorbing qualities of dark red, the brightest light intensity could be achieved in all the other colored rooms whose paint would reflect light more. The light rheostat was capable of dimming sufficiently so that the dim level in the dark red room could be obtained in all other colored rooms. However, because of the wide range of light reflectance potential of various colors and various lightness levels of color, it meant that to keep the light reflectance of the colored walls constant, there would have to be a large range of light intensity of direct readings of the light source from one color to the next. Direct readings were taken by the Gossen Lunasix meter from 2'-6" above the floor, beneath the light source (a distance of 5'-2" between the meter and the light fixture). The direct readings are listed in the next section of this chapter.

Light reflectance readings off four walls were chosen as the constant factor rather than direct readings, because of precedent. Architectural determinants, such as lighting, are typically measured not so much in terms of light emitting characteristics of the light source (this is usually established by the light manufacturer) but in terms of what happens to these characteristics of the light in a particular environment, e.g., how much distance between the objects being lighted and the lighting apparatus, how evenly the light is distributed throughout the space, how much of the light is reflected, and other considerations pertinent to the relationship between the light apparatus and the environment in which it is placed.

A second reason for the indirect readings is that since color is an independent variable in the experiment, it was felt that the manner in which color would influence the light level under each condition had more bearing upon the purpose of the experiment than a measure which virtually ignored the effects of color on light level, such as direct readings.

The second problem of the pilot study is related to the accuracy of the Gossen Lunasix light meter. The question of accuracy relates

Table 3

Wall Reflectance Value for Each Level of Illumination

Dim Comfortable Level

		Gossen Scale			
Sequence Order	Rank Order	Wall #1	Wall #2	Wall #3	Wall #4
1	5	6.00	4.75	4.25	5.50
2	4	6.75	5.50	4.75	6.25
3	1	10.75	10.00	10.00	10.50
4	3	8.25	7.25	7.00	8.00
5	2	10.25	9.75	9.50	10.00
6	6	5.00	4.00	4.00	4.50
7	9	3.00	2.00	1.50	2.50
8	8	4.00	2.50	2.50	3.50
9	6	5.00	4.00	4.00	4.50

		Translation into Foot Candle Units			
Sequence Order	Rank Order	Wall #1	Wall #2	Wall #3	Wall #4
1	5	.44	.19	.14	.33
2	4	.77	.33	.19	.55
3	1	12.25	7.00	7.00	10.50
4	3	2.63	1.10	.88	1.75
5	2	8.75	6.20	5.25	7.00
6	6	.22	.11	.11	.71
7	9	.06	.03	.02	.04
8	8	.11	.04	.04	.08
9	6	.22	.11	.11	.17

Comfortably Lighted Level

		Gossen Scale			
Sequence Order	Rank Order	Wall #1	Wall #2	Wall #3	Wall #4
1	2	11.00	10.50	10.50	11.00
2	2	11.00	10.50	10.50	11.00
3	4	10.50	9.75	9.75	10.50
4	7	9.00	8.25	8.25	9.00
5	9	5.25	4.00	4.00	4.75
6	6	10.00	9.25	9.25	10.00
7	5	10.25	9.75	9.75	10.50
8	2	11.00	10.50	10.50	11.00
9	8	8.00	7.00	7.00	8.00

Table 3 (continued)

Translation into Foot Candle Units

Sequence Order	Rank Order	Wall #1	Wall #2	Wall #3	Wall #4
1	2	14.00	10.50	10.50	14.00
2	2	14.00	10.50	10.50	14.00
3	4	10.50	6.20	6.20	10.50
4	7	3.50	2.63	2.63	3.50
5	9	.27	.11	.11	.19
6	6	7.00	5.25	5.25	7.00
7	5	8.75	5.25	6.13	10.50
8	2	14.00	10.50	10.50	14.00
9	8	1.75	.88	.88	1.75

Bright Comfortable Level

Gossen Scale

Sequence Order	Rank Order	Wall #1	Wall #2	Wall #3	Wall #4
1	2	11.00	10.50	10.50	11.00
2	4	11.00	10.00	10.00	11.00
3	2	11.00	10.50	10.50	11.00
4	2	11.00	10.50	10.50	11.00
5	8	10.00	9.50	9.50	10.00
6	7	10.50	9.75	10.00	10.50
7	5	10.75	10.00	10.25	10.75
8	6	10.50	10.00	10.00	10.50
9	9	8.00	6.75	6.75	7.50

Translation into Foot Candle Units

Sequence Order	Rank Order	Wall #1	Wall #2	Wall #3	Wall #4
1	2	14.00	10.50	10.50	14.00
2	4	14.00	7.00	7.00	14.00
3	2	14.00	10.50	10.50	14.00
4	2	14.00	10.50	10.50	14.00
5	8	7.00	5.25	5.25	7.00
6	7	10.50	6.20	7.00	7.00
7	5	12.25	7.00	8.75	12.25
8	6	10.50	7.00	7.00	10.50
9	9	1.75	.77	.77	1.32

to two areas. First, it was presumed that the meter read correctly. Second, the wall reflectance measures should have been made in foot lamberts rather than on a foot candle scale. However, neither the first nor the second check was made, because in the first case, an apparatus more reliable than the one the experimenter used could not be located, and in the second case, procuring a meter which read in foot lamberts for the length of time it took to conduct the experiment (16 weeks) was prohibitively expensive.

The above precedure provided nine rooms, each with one hue, one lightness level for the hue, and three light intensities. Hence, with the three hues, three lightness levels, and three light intensities, there were 27 conditions of variations of color and light in the environment.

Since only four rooms could be available at one time, the three hues, each with three lightnesses, were ordered at random in the experimental sequence and then assigned at random to the rooms. The order was: Dark Red, Light Yellow, Dark Yellow, Medium Blue, Medium Red, Light Blue, Medium Yellow, Dark Blue, and Light Red. The assignment of the lightness levels to the rooms were as follows:

Room No. 1 (South End)	Dark Yellow, Medium Red
Room No. 2	Dark Red, Dark Blue
Room No. 3	Medium Blue, Light Blue, Light Red
Room No. 4 (North End)	Light Yellow, Medium Yellow

Each room received two coats of paint of the assigned color.

The results of the pilot study in regard to the lightnesses of each hue and the illumination levels have been used to fix the treatment levels for the main experiment. In review, the experimental colors are red, blue, and yellow; the lightness levels of each hue, as listed in Colorizer Paints Album, are for red (IF 49, ID 25, and IB 1), for blue (7F 43, 7E 25, and 7B 7), and for yellow (20C 49, 20B 25, and 20A 1); and the three illumination levels (indirect readings) range for the four walls: .14-.44 foot candles under dim lighting, 5.25-10.50 foot candles under comfortable lighting, and 7.00-12.25 foot candles under bright lighting.

The Main Experiment

Subjects

Two hundred and seventy students recruited from Psychology 5 classes at the University of Utah were used as subjects in the main experiment. One hundred and thirty-five men were divided into 27 subgroups, one subgroup for each hue, hue lightness, and light intensity combination.

The same procedure was used for 135 women. Tables 4 and 5 list the demographic data on the male and female subjects respectively.

Experimental Tape

The tape recording used in the experiment passed through several phases before it reached its completed form. The early phases of the tape construction were described by Miller (1966):

> In this study of the communication of emotions, a group of 80 S's....asked to decode the emotional meaning intended in a standardized 96-item experimental tape containing neutral phrases spoken in various moods.
>
> S's were also asked to portray the six moods of "flirting," "sad," "happy," "fearful," "indifferent," and "anger," using three neutral phrases per mood and the resulting 18 items constituted the encoding measure. These 1,440 encoding attempts of the 80 S's were randomly placed on three master tapes and judged as to the intended emotional meaning by three groups of judges with 30 in each group. Accuracy of encoding was determined by the extent of agreement between judge ratings and the intended mood of S's (p. 1 Abstract).

Certain weaknesses in the tapes used by Miller have since been partially eliminated. First, in order to increase the reliability of measuring the decoding abilities of the subjects, the tape items were increased from 96 to 204. Second, the 204-item tape contained items of varying judged agreement levels, i.e., to increase the sensitivity of the tape as a measurement of skill in interpreting emotional communications, the additional items on the tape contained varying judgments of agreement rather than one, high level of agreement. And finally, it was felt that the 96-item tape could not be used for analysis of variance statistical evaluations, because the judgments were not along an interval scale (instead, responses were placed in categories), and because the assumption of homogeneity of variance would probably be violated when an unequal number of responses are recorded across the mood categories.

The criterion used in the present experiment, which was felt to resolve the above problem, was a decoding of the intensity of the emotion expressed on the tape. The subjects rated each emotional communication on an interval scale from one to nine. Each emotion on the tape was labeled, so that all the subjects knew which emotion to rate.

Procedure

Ten subjects, five men and five women, composed an experimental group for each hue, hue lightness, and illumination combination. The

Table 4

Analysis of 135 Male Subjects in Terms of Age, College Year, and Major

Major	Freshmen							Sophomore								Junior		Senior	Grad.			Total
Age	18-19	20-21	22-23	24-26	27-33	35-36		19-20	21-22	23-25	27-28	29-31	34-38		19-20	21-23	26-33		23-29		39-47	Total
Education	1		1					3		1							1					7
Undecided	11	6	2	2	3			1	2	1		1										29
Business	6		2	1	3			1	3	2	2				2	2	1		2			27
Medical Dental	7					3		3	1										1			15
Social Sciences	4		4	1	1	4		5	2	1		2					1					25
Physical Sciences	7	1				2		3		1					2				1		1	18
Language & Lit.	1							2	1													4
Fine Arts																						
History			1			2							1		2	1						7
Home Economics																						
Biology	1											2				1						4
Age Total	38	7	10	4	7	11		18	9	6	2	3	1		6	5	2		4		1	135

Table 5

Analysis of 135 Female Subjects in Terms of Age, College Year, and Major

Major	Freshmen								Sophomore						Junior					Senior		Grad.	
Age	18-19	20-21	22-23	24-26	27-33	35-36	39-41		19-20	21-22	23-25		29-31		19-20	21-25	26-33	40-43		23-29		39-47	TOTAL
Education	17	2	2	1	3	1	1		12		1		1		6	2	1	1					52
Undecided	16	1			1				2							1							21
Business									1														1
Medical Dental	6			1	1				6						1								15
Social Sciences	3				1	1			5													1	11
Physical Sciences	2																						2
Language & Lit.	8	1			1				2	7													19
Fine Arts	4																						4
History	3														1								4
Home Economics	4	1													1								6
Biology																							
Age Total	63	5	2	2	7	2	1		28	7	1		1		7	5	1	1	1			1	135

groups were either entirely men or entirely women, not both. A maximum of five persons could be scheduled for any given session, but usually two or three were scheduled. No record was kept of the number of subjects tested per session; an experimental phase was repeated until the subject quota was filled. Admittedly, the factor of social participation might interact with the independent variables.

Another concern is that the testing sessions followed a tight schedule (typically from 9:55 a.m. until 7:30 p.m., whenever subjects could be recruited). Hence, variations in the scheduling occurred for all the experimental conditions. Additionally, because the experiments spanned a period of 16 weeks, seasonal changes loom as a possible contaminating factor.

Each subject completed three sequential steps without knowing which step followed the one he was working on. The three steps are:

(1) To listen to a tape recording of 204 phrases spoken with one of six emotional states (fear, anger, indifference, happy, sad, and flirting) and decide how intensely each emotion is expressed on a nine-point scale. The specific instructions were:

> In the following tape you will hear 480 phrases.[5] Each phrase ("hello," "good morning," or "how are you?") is spoken with a different feeling. Some are spoken by a man, others by a woman. After hearing each phrase, your task is to decide how intensely a particular emotion is expressed in the phrase. Indicate your choice on the scales on your answer sheets. Mark the spaces between the lines over the number which best rates the intensity of the communicated feeling. Please mark only one choice for each phrase. A few seconds before each phrase you will hear a number. Make sure that your rating on the scale on the answer sheet goes with the number spoken in the tape recording. If any items are not clear, make a guess anyway.

The appendix contains the complete instructions and rating scales.

The tape recording was made by members of the Clinical Psychology Program at the University of Utah. The order and sex of the emotional portrayals were randomized.

(2) To write a response to the following instruction: "Please write on the last page of your answer sheets, in a sentence or two, what you think the experiment is about." The second instruction

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[5] The original tape contained 480 phrases and was later reduced to 204 phrases. The change was overlooked when writing up the instructions.

determined whether the subjects were cognizant of the independent variables. Those who indicated knowledge of one or more of the variables under study or who referred to the environment in general as a variable were replaced by additional Psychology 5 students.

Possibly subjects knew or correctly suspected the purpose of the experiment, but failed to acknowledge the actual purpose for a number of reasons, e.g., preference for alternative answer, chose not to let the experimenter know that he had been told, could not determine how color or light entered into the study. No attempt was made to discriminate between those who knew and acknowledged, those who knew and did not acknowledge, and those who did not know the purpose.

(3) To take the Dvorine Pseudo-Isochromatic Plates (Dvorine, 1953) in a fifth, neutrally colored room. Those who were color-blind either wholly or in part, according to the color discrimination standards of the Dvorine test, were replaced by additional Psychology 5 students.

Direct and indirect light readings were taken for each experimental phase. Changes in the location of the light apparatus from one room to the next, the functioning of the light rheostat, the aging of the light tubes, and the color of the walls produced variations in the amount of light reflected off each wall for each condition. The light reflectance values, as recorded by the Gossen light meter with translations into foot candle units, are listed in Table 6.

Variations in the location of the light occurred with differences in the location of the apparatus hooks, which had to be drilled into the ceiling joint nearest the center of the room. The location differences never varied more than two inches in any direction from the center of the ceiling; however, it seems possible that at least in part the reflectance of the light off the walls in a 10 foot square room was influenced by the location of the apparatus.

It may be observed that the dim light reflectance values for the light hues of yellow, blue, and red were higher than the dim light reflectance values of the medium and dark hue conditions. Under dim lighting, there was a tendency for the flourescent light fixture to flutter below a certain point (direct reading: 11.50, Gossen Scale). Under the above mentioned color conditions, the minimum point the light could be dimmed without making the light flicker served as an additional standard for dim lighting. The light reflectance off walls under light hues is stronger than that of the darker hues. However, the difference between the desired level and the resolved level is small (less than half a foot candle).

A different problem occurred for the comfortable and bright light intensities. The Gossen Scale has units of equal length over which a needle moves. The values of the units, however, increase geometrically. Thus, the difference between 4.25 and 6.25 on the Gossen Scale, which was the largest difference found under the dim comfortable light condition,

Table 6

Light Reflectance Values According to the Gossen Lunasix Meter Scale with Translations into Foot Candle Units for Three Light Intensities

Dim Comfortable Level

	Gossen Scale			
Room Color	Wall #1	Wall #2	Wall #3	Wall #4
Dark Red	6.00	4.75	4.25	5.50
Light Yellow	6.00	5.50	5.75	5.75
Dark Yellow	5.75	5.00	4.75	5.50
Medium Blue	6.50	5.75	6.00	6.50
Medium Yellow	6.50	6.00	6.25	6.75
Medium Red	6.00	5.00	5.50	6.25
Light Blue	6.50	5.75	6.00	6.50
Dark Blue	5.75	5.00	5.50	6.00
Light Red	6.00	5.50	5.25	5.75

	Translation into Foot Candle Units			
Room Color	Wall #1	Wall #2	Wall #3	Wall #4
Dark Red	.44	.19	.14	.33
Light Yellow	.44	.38	.27	.39
Dark Yellow	.39	.22	.44	.33
Medium Blue	.66	.39	.44	.66
Medium Yellow	.66	.44	.55	.77
Medium Red	.44	.22	.33	.55
Light Blue	.66	.39	.44	.66
Dark Blue	.39	.22	.33	.44
Light Red	.44	.33	.28	.39

Comfortably Lighted Level

	Gossen Scale			
Room Color	Wall #1	Wall #2	Wall #3	Wall #4
Dark Red	10.25	9.50	9.75	10.50
Light Yellow	10.50	10.00	10.00	10.50
Dark Yellow	10.25	9.50	9.50	10.00
Medium Blue	10.00	9.50	9.50	10.25
Medium Yellow	10.50	10.00	10.00	10.50
Medium Red	10.00	9.50	9.50	10.00
Light Blue	10.25	9.75	9.75	10.00
Dark Blue	10.25	9.50	10.00	10.25
Light Red	10.25	9.50	9.50	10.00

Table 6 (continued)

	Translations into Foot Candle Units			
Room Color	Wall #1	Wall #2	Wall #3	Wall #4
Dark Red	8.25	5.25	6.13	10.50
Light Yellow	10.50	7.00	7.00	10.50
Dark Yellow	8.75	5.25	5.25	7.00
Medium Blue	7.00	5.25	5.25	8.75
Medium Yellow	10.50	7.00	7.00	10.50
Medium Red	7.00	5.25	5.25	7.00
Light Blue	8.75	6.13	6.13	7.00
Dark Blue	8.75	5.25	7.00	8.75
Light Red	8.75	5.25	5.25	7.00
	Bright Comfortable Level Gossen Scale			
Dark Red	10.75	10.00	10.25	10.75
Light Yellow	11.00	10.75	10.75	11.00
Dark Yellow	10.75	10.25	9.75	10.50
Medium Blue	10.75	10.25	10.00	10.75
Medium Red	10.75	10.00	10.00	10.75
Medium Yellow	11.00	10.50	10.75	11.00
Light Blue	11.00	10.50	10.75	11.00
Dark Blue	10.75	10.00	10.50	10.75
Light Red	11.00	10.75	10.50	11.00
	Translation into Foot Candle Units			
Dark Red	12.25	7.00	8.25	12.25
Light Yellow	14.00	12.25	12.25	14.00
Dark Yellow	12.25	8.75	6.20	10.50
Medium Yellow	12.25	8.75	7.00	12.25
Medium Blue	14.00	10.50	12.25	14.00
Medium Red	12.25	7.00	7.00	12.25
Light Blue	14.00	10.50	12.25	14.00
Dark Blue	12.25	7.00	10.50	12.25
Light Red	14.00	12.25	10.50	14.00

becomes a difference of .41 foot candles, because the scale unit values are .14 and .55 foot candles respectively. With the bright light condition, the largest difference, according to the Gossen Scale, was from 9.75 to 10.75, which becomes 6.20 and 12.25 foot candles, respectively--a difference of 6.05 foot candles.

Color influenced the amount of light reflectance greatly. With an attempt to keep the reflectance values constant for all hue conditions, there was a great range of direct reading values reported by the light meter, because light intensity in a room is highly dependent upon the color of the room and the lightness of that color. To make the direct and indirect readings constant, the color and its lightness could not be varied. Table 7 shows the direct readings for each experimental condition.

Disturbances external to the intended procedure, e.g., persons moving about, machine noise, talking, etc., were kept as low as can be reasonably expected by requests from the experimenter. On the floor below the experimental rooms were heavy-duty machines, which were not used during the experimental sessions. Some noises and disturbances occurred somewhat randomly throughout the experiments which could not be avoided, e.g., typing, occasional foot steps, weather changes, automobile sounds, etc. It is the writer's opinion that the frequency and amplitude of these disturbances were insufficient to significantly influence the data collection.

Temperature was controlled within limits (thermostat regulating a duct heating system). A record was kept of daily temperature changes (Table 8) to determine whether temperature was a contributing influence which varied. Measures were taken twice daily (10:30 a.m. and 4:30 p.m.) when experiments were made. Table 8 shows, it may be observed, that the range of the variance is small for the entire testing period (15°) as it was for the greatest change in one day (7°).

Table 7

Direct Readings of the Light Source

Room Color	Gossen Scale	Foot Candle Units
Dim Comfortable Level		
Dark Red	12.25	35.00
Light Yellow	-----	-----[a]
Dark Yellow	12.25	35.00
Medium Blue	12.00	28.00
Medium Yellow	11.50	21.00
Medium Red	12.25	35.00
Light Blue	11.50	21.00
Dark Blue	13.50	83.00
Light Red	11.75	25.00
Comfortably Lighted Level		
Dark Red	16.50	660.00
Light Yellow	-----	-----
Dark Yellow	15.00	220.00
Medium Blue	15.50	330.00
Medium Yellow	14.50	175.00
Medium Red	15.75	375.00
Light Blue	14.50	175.00
Dark Blue	17.00	880.00
Bright Comfortable Level		
Dark Red	17.75	1,315.00
Light Yellow	-----	-----
Dark Yellow	15.75	375.00
Medium Blue	16.75	770.00
Medium Yellow	15.50	330.00
Medium Red	16.75	770.00
Light Blue	16.25	550.00
Dark Blue	18.00	1,750.00
Light Red	15.75	375.00

[a] Direct readings for the light yellow condition were omitted.

Table 8

Daily Temperature Changes[a]

Date	Room Color	10:30 a.m. (degrees)	4:30 p.m. (degrees)
2/8/67	Light Yellow	75	76
2/9/67	Light Yellow	74	--
2/10/67	Medium Blue	73	72
2/15/67	Medium Blue	73	73
2/16/67	Medium Blue	70	71
2/17/67	Dark Yellow	75	80
2/20/67	Dark Yellow	74	81
2/21/67	Dark Yellow	71	73
2/22/67	Medium Yellow	72	78
2/24/67	Medium Yellow	75	77
2/28/67	Medium Yellow	74	77
3/1/67	Medium Yellow	72	76
3/2/67	Medium Yellow	75	76
3/3/67	Medium Yellow	71	74
4/10/67	Medium Yellow	74	75
4/11/67	Dark Red	67	73
4/12/67	Medium Red	68	70
4/13/67	Medium Red	68	75
4/14/67	Medium Red	68	70
4/19/67	Light Blue	72	73
4/21/67	Light Blue	74	75
4/24/67	Light Blue	75	75
4/25/67	Light Blue	72	75
4/26/67	Light Blue	76	76
4/27/67	Light Blue	70	72
4/28/67	Light Blue	72	72
5/1/67	Light Blue	77	82
5/2/67	Dark Blue	77	77
5/4/67	Dark Blue	72	75
5/5/67	Dark Blue	67	74
5/8/67	Dark Blue	73	75
5/9/67	Dark Blue	74	--
5/12/67	Dark Blue	--	--

[a] Note: A record of daily temperature changes did not begin until February 8, 1967. The experimental sessions began January 9, 1967.

CHAPTER V

RESULTS

A 3 X 3 X 3 X 2 X 3 X 6 (Color X Hue lightness X illumination X Sex X Time X Emotion) factorial analysis of variance with repeated measures on the Time and Emotion variables was computed to measure the effects of the independent variables upon the dependent variable. The analysis of variance model used was completely fixed.

The data analyzed were ratings of the intensity of the emotions by subjects within a standard 33 minute experimental session. Subjects were requested to judge the intensity of each of 204 phrases presented with a tape recorder. The intensity judgment was recorded by the subject's placing of an "X" along a nine-point scale for each phrase presented. Each subject's mean judgments were tabulated in a matrix (Table 9). The mean scale values for each emotion were recorded in the columns and the mean scale values over time were recorded in the rows. There was one score for each cell and 18 scores for each subject.

The results are presented as they apply to the hypotheses listed at the end of the third chapter. Each hypothesis is discussed in turn.

Hypothesis I. The judged intensities of the emoted phrases differ signigicantly across varying combinations of color and light for all six emotions.

The factorial analysis of variance yield significant *F* ratios for ratings of each emotion, for ratings over time, and for the interaction between the emotion and time variables. Insignificant *F* ratios were found for the independent variables of color, hue lightness, and illumination. Table 10 shows the summary table for all the *F* tests. Thus, based on an analysis of global behavioral distinctions between environmental factors, the hypothesis that color and light manipulated in our surroundings can influence perception of portrayed emotions cannot be supported by the data.

Since the first hypothesis is not supported, a question is raised as to whether the other hypotheses can be supported, because they require an analysis of specific factor relationships and are concerned with trends. In a factorial design, opinions vary about the ethics of investigating specific questions relating to a few of the variables in the model when the *F* tests[5] show that "nothing" happened; however, it is generally agreed that specific questions may be pursued if there is a "good *a priori* reason" (Winer, 1962). It is possible that the mean ratings for each treatment varied in opposite directions, thus cancelling one another out. On the other hand, unless the researcher

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[5] The *F* distribution is concerned with the situation where the variances of distinct populations are compared for equality.

Table 9

Tabulation Chart of the Scores from Each Subject

Experimental Time Sequence	Fear	Anger	Indiff.	Happy	Sad	Flirt.
After 68 item Responses (Approx. 11 Minutes)	MEAN	MEAN	MEAN	MEAN	MEAN	MEAN
After 136 item Responses (Approx. 22 Minutes)	MEAN	MEAN	MEAN	MEAN	MEAN	MEAN
After 204 item Responses (Approx. 33 Minutes)	MEAN	MEAN	MEAN	MEAN	MEAN	MEAN

Note.--Mean scale values for each emotion are recorded in the columns and the mean scale values over time are recorded in the rows.

Table 10 (continued)

Source of Variation	df	SS	MS	F
E X F	10	5,556,927.70	555,692.78	25.75**
A X B X E	8	502,140.75	62,767.59	1.22
A X B X F	20	963,453.88	48,172.69	1.07
A X C X E	8	310,608.56	43,826.07	.85
A X C X F	20	1,033,595.13	51,697.75	1.15
A X D X E	4	148,023.87	37,005.97	.72
A X D X F	10	178,828.50	17,882.85	.39
A X E X F	20	419,341.75	20,967.09	.97
B X C X E	8	491,968.69	61,496.09	1.20
B X C X F	20	774,316.50	38,715.82	.86
B X D X E	4	138,005.62	34,501.41	.67
B X D X F	10	151,252.75	15,125.27	.33
B X E X F	20	256,168.00	12,808.40	.59
C X D X E	4	180,851.37	45,212.84	.88
C X D X F	10	385,174.62	38,517.46	.86
C X E X F	20	450,093.50	22,504.68	1.04
D X E X F	10	161,546.25	16,154.63	.74
A X B X C X E	16	783,423.38	48,963.96	.95
A X B X C X F	40	1,723,474.70	43,086.87	.96
A X B X D X E	8	437,985.25	54,748.16	1.06
A X B X D X F	20	1,006,420.25	50,321.01	1.12
A X B X E X F	40	970,119.26	24,252.98	1.12
A X C X D X E	8	396,056.38	49,507.05	.96
A X C X D X F	20	1,059,630.00	52,981.80	1.18
A X C X E X F	40	1,162,850.00	29,071.25	1.34
A X D X E X F	20	490,212.75	24,510.64	1.13
B X C X D X E	8	359,025.75	44,878.22	.87
B X C X D X F	20	806,131.26	40,306.56	.90
B X C X E X F	40	1,062,562.20	26,566.31	1.23
B X D X E X F	20	548,543.01	27,427.15	1.27
C X D X E X F	20	616,047.75	30,802.39	1.42
A X B X C X D X E	16	992,417.01	62,026.06	1.21
A X B X C X D X F	40	1,564,751.00	39,118.78	.87
A X B X C X E X F	80	1,782,944.00	22,286.80	1.03
A X B X C X E X F	40	595,742.26	14,893.56	.69
A X C X D X E X F	40	818,762.26	20,469.06	.94
B X C X D X E X F	40	704,729.25	17,618.23	.81
A X B X C X D X E X F	80	2,120,933.90	26,511.81	1.22
E X SS/Groups	432	22,115,789.15	51,193.95	
F X SS/Groups	1080	48,305,291.95	44,727.12	
E X F X SS/Groups	2160	46,612,574.81	21,579.89	
Total	4859	225,604,240.00		

Table 10

Analysis of Variance for Color, Hue Lightness, Illumination, Sex, Time, and Emotion

Source of Variation	df	SS	MS	F
Between	269			
A (Color)	2	453,534.80	226,767.40	.99
B (Hue Lightness)	2	104,077.73	52,038.87	.22
C (Illumination)	2	391,901.48	159,950.74	.69
D (Sex)	1	751,320.32	751,320.32	3.28
A X B	4	940,253.12	235,063.28	1.02
A X C	4	1,282,287.20	320,571,82	1.40
A X D	2	444,103.16	222,051.58	.97
B X C	4	966,441.57	241,610.39	1.05
B X D	2	488,687.36	244,343.68	1.06
C X D	2	318,098.61	159,049.30	.69
A X B X C	8	1,763,500.70	220,437.59	.96
A X B X D	4	471,685.03	117,921.26	.51
A X C X D	4	730,021.44	182,730.35	.79
B X C X D	4	622,507.41	155,626.85	.68
A X B X C X D	8	1,850,988.60	231,373.58	1.01
Ss/Groups	216	49,360,046.73	228,518.73	
Within	4,590			
E (Time)	2	3,113,900.10	1,556,950.00	30.41**
F (Emotion)	5	9,622,444.00	1,924,488.80	43.02**
A X E	4	286,391.50	71,594.88	1.39
A X F	10	508,834.50	50,883.45	1.13
B X E	4	222,716.03	55,679.01	1.08
B X F	10	684,734.26	68,473.43	1.53
C X E	4	233,267.72	58,316.93	1.13
C X F	10	368,007.75	36,800.76	.82
D X E	2	227,012.16	113,506.08	2.21
D X F	5	289,802.50	57,960.50	1.29

**Significant at .01 level.

has a strong foundation for examining specific relationships, he may be generating some significant results by chance; i.e., he may be committing Type II errors.

The importance of this study is to determine what happened, i.e., how the mean intensity judgments differed across experimental conditions, not just if anything happened. The factorial analysis of variance indicates that nothing happened. However, treatment effects may have been obscured by other variation (Hays, 1963). Since the five parts of the second hypotheses, which state specific directions in which the mean scale judgments are expected to go under specific conditions, are based upon results of previous research in the area, it was felt that specific questions may be analyzed.

An additional consideration is the purpose of the investigation. Unlimited examinations of specific questions endanger the validity of the results when the experimenter attempts to generalize effects. However, if the investigator's purpose is to pursue questions which seem potentially meaningful for future, more sensitive experimental studies, then the validity of the findings are not weakened because meaningful relationships described in the current experiment will have to be verified in subsequent efforts.

Hypothesis 2. The judgments assume the following patterns:

a. The mean judgment of the emotion *anger* increases significantly over the mean judgments of the other emotions under the conditions of a *red room* and a *yellow room* (illumination level "bright").

b. The mean judgment of the emotion *sad* increases significantly over the mean judgments of the other emotions under the condition of a *blue room* (illumination level "dim").

c. The mean judgment of the emotion *happy* increases significantly over the mean judgments of the other emotions under the conditions of *dark hue lightness* and *medium lightness room* (illumination level "comfortable").

d. The mean judgment of the emotion *fear* increases significantly over the mean judgments of the other emotions under the condition of a *blue room* and a *yellow room* (illumination level "dim").

e. The mean judgment of the portrayal of *flirting* increases significantly over the mean judgments of the other portrayals under the condition of a *dark red room* (illumination level "dim").

Figure 2 shows the differential mean ratings of each emotion across the three colors (red, blue, and yellow). A F test was computed for the emotion *sad*, because it shows the sharpest change from color to color. Table II shows the analysis of variance for this test.

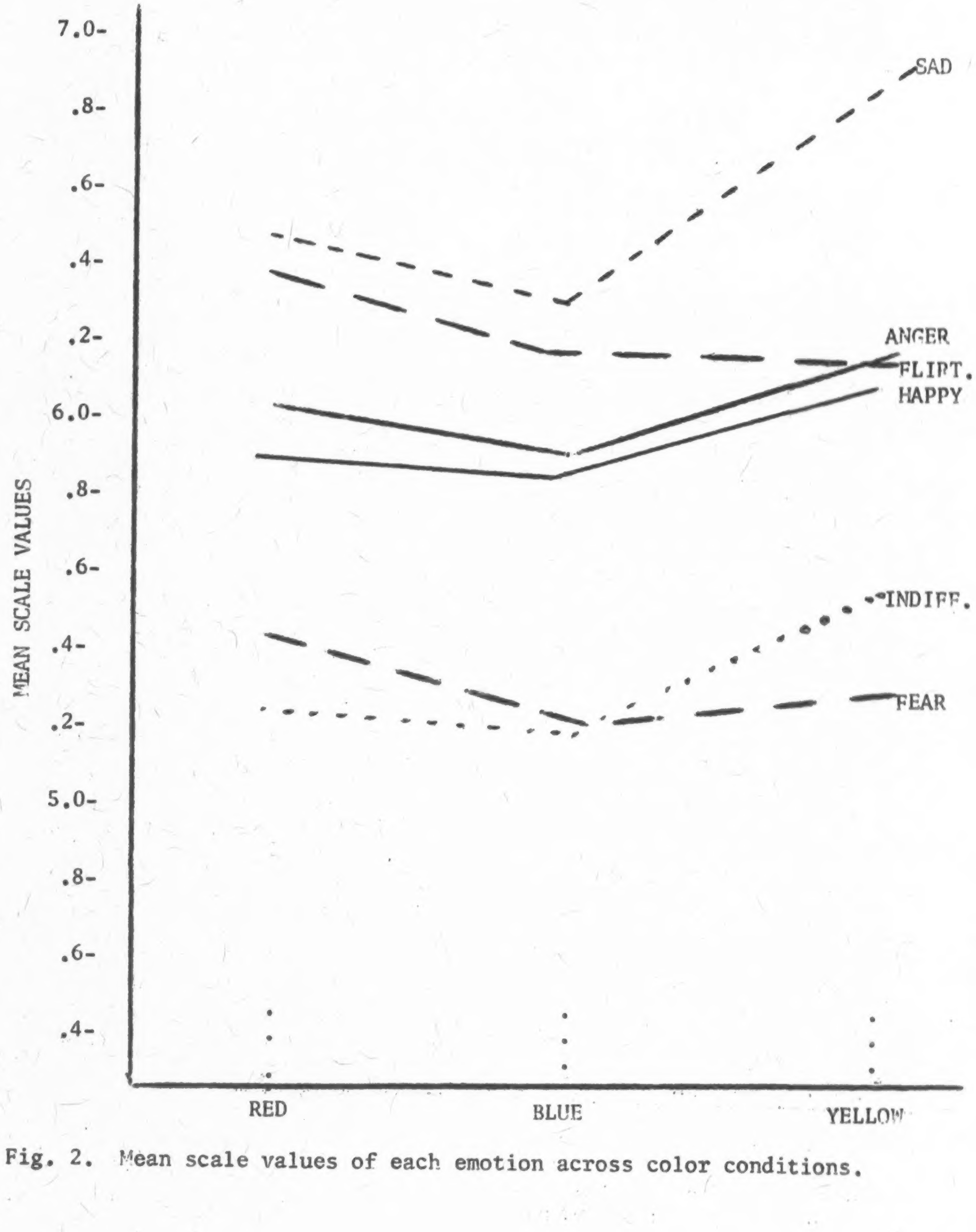

Fig. 2. Mean scale values of each emotion across color conditions.

Table 11

Analysis of Variance for Mean Sad Responses across Color Conditions

Source of Variation	df	SS	MS	F
Color	2	3,613,336.20	1,806,668.10	.77
Ss/Groups	267	624,320,300.00	2,338,278.20	
Total	269	627,933,636.20		

The change in mean ratings across colors is insignificant; hence, the changes for the other emotions, which are of less magnitude, would also be insignificant.

A second test was made for the responses to sad across three intensities of light. Figure 3 shows the respective means for each emotion under the light conditions. Again, sad was chosen as the test emotion, because it shows a relatively greater change along the treatment levels. Table 12 shows the analysis of variance for this test.

Table 12

Analysis of Variance for the Sad Responses to the Illumination Levels

Source of Variation	df	SS	MS	F
Illumination	2	8,325,213.60	4,162,606.80	1.79
Ss/Groups	267	619,608,410.00	2,320,630.70	
Total	269	627,933,636.20		

The mean change is insignificant for the responses to sad stimuli; hence, so are the variations for the other emotion means.

A third test was computed for dim lighting across the color conditions. Dim lighting was chosen as the constant variable, because, as Figure 4 shows, that level varied the most across colors. Table 13 shows the test for responses to six emotions under dim lighting. The emotion categories, in this case, were collapsed.

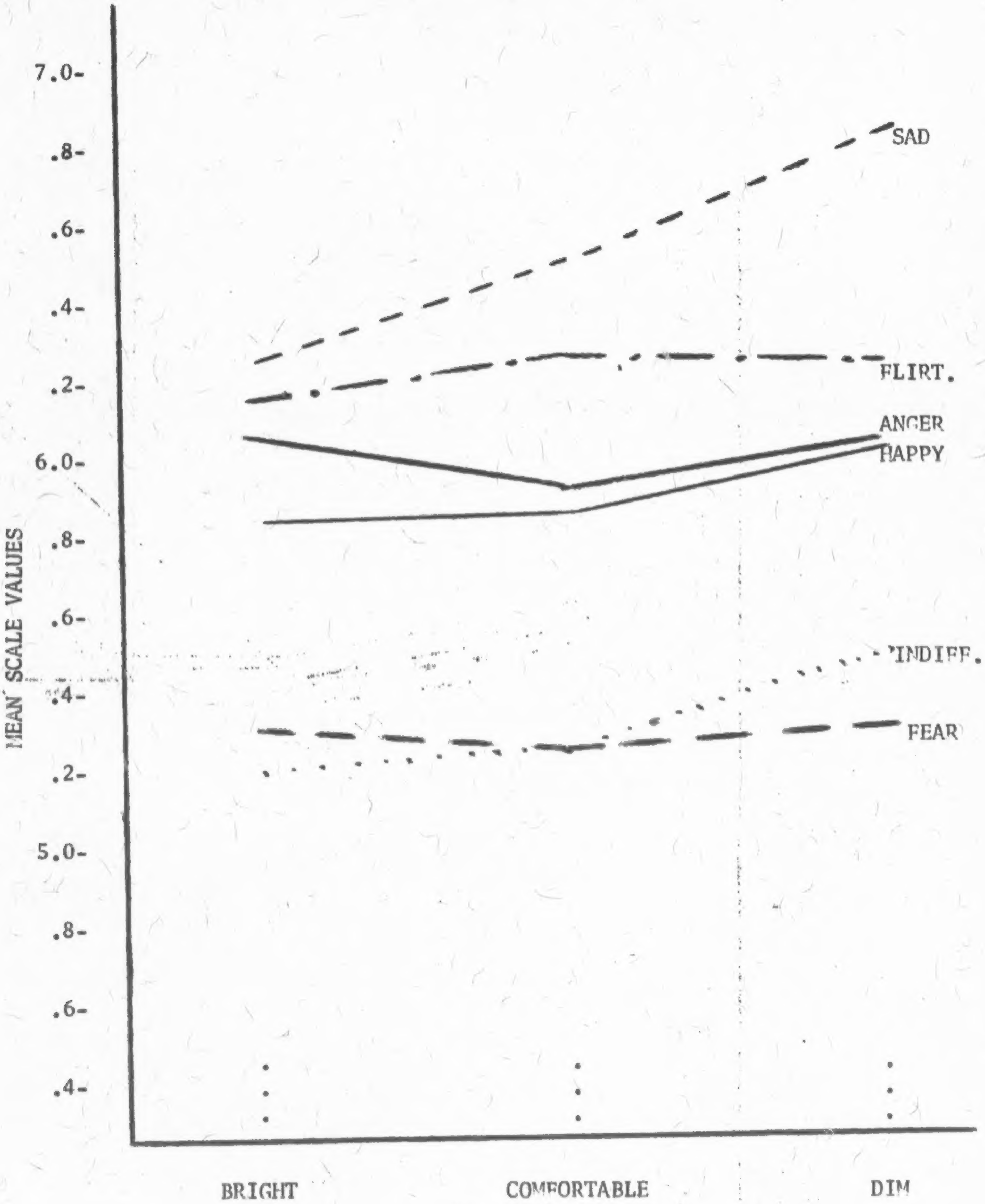

Fig. 3. Mean scale values of each emotion across illumination levels.

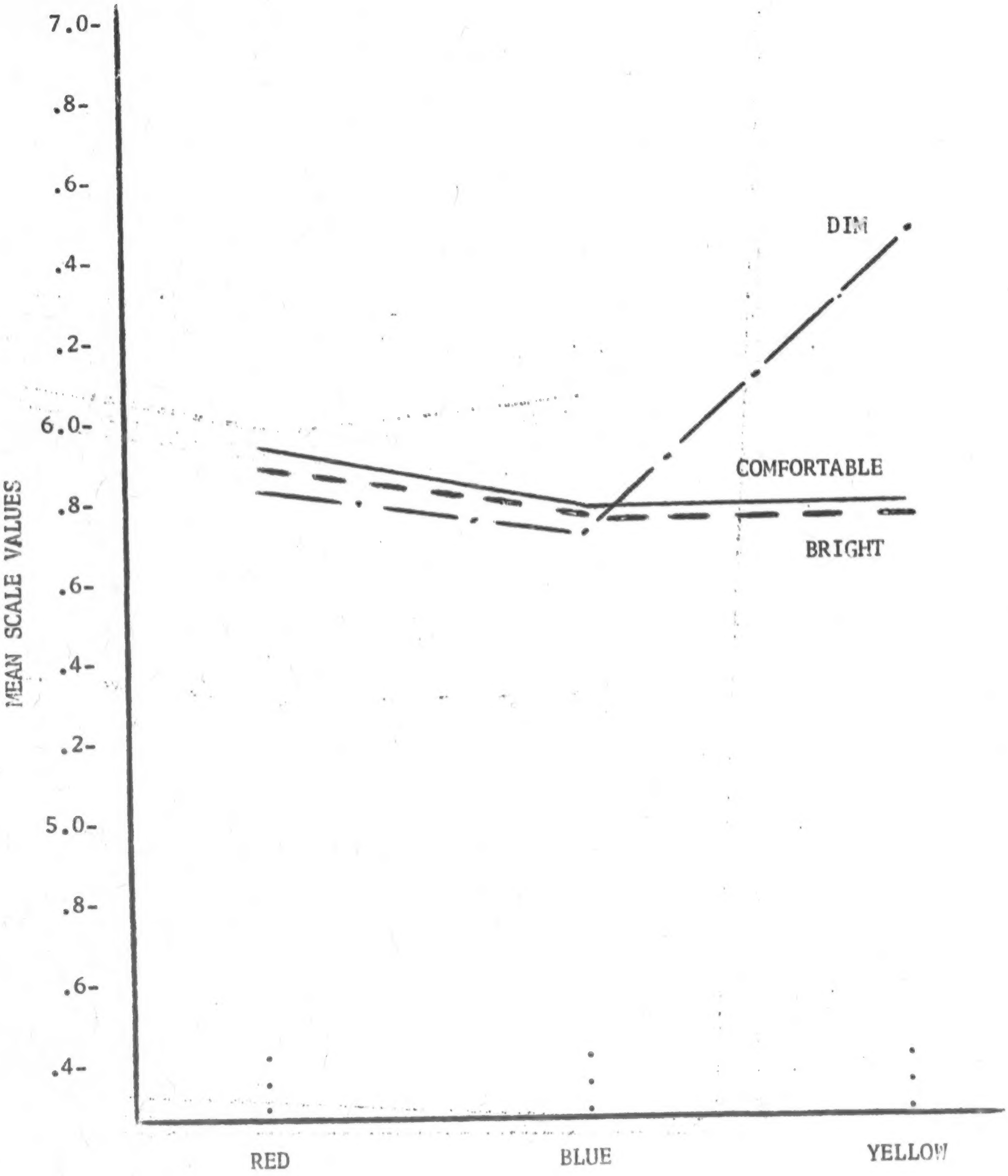

Fig. 4. Mean scale values of intensity ratings under each illumination level across color conditions.

Table 13

Analysis of Variance for Mean Responses to Dim Lighting Across Color Conditions

Source of Variation	df	SS	MS	F
Color	2	1,588,916.00	794,458.05	1.38
*S*s/Groups	87	49,841,428.00	572,889.97	
Total	89	51,430,344.00		

The means did not differ significantly.

An alternative consideration was to examine not only mean scale value differences under dim lighting across colors, but to test the mean scale differences under each color condition across the illumination levels. Figure 5 shows the latter relationship of color to illumination. A *F* test was made for the mean responses in yellow rooms across illumination levels. Table 14 shows this test.

Table 14

Analysis of Variance for Mean Responses under Yellow Conditions across Illumination Levels

Source of Variation	df	SS	MS	F
Illumination	2	1,558,318.00	779,159.02	1.54
*S*s/Groups	87	49,119,218.00	507,117.44	
Total	89	50,677,536.00		

The mean response under yellow conditions did not differ significantly.

To discern possible meaningful patterns between the variables hue lightness and emotion, the means of their interaction were plotted (Figure 6). A *F* test was made for responses to *sad* stimuli, again, because that emotion mean varied the most across the hue lightnesses. Table 15 shows the analysis of variance of that treatment effect.

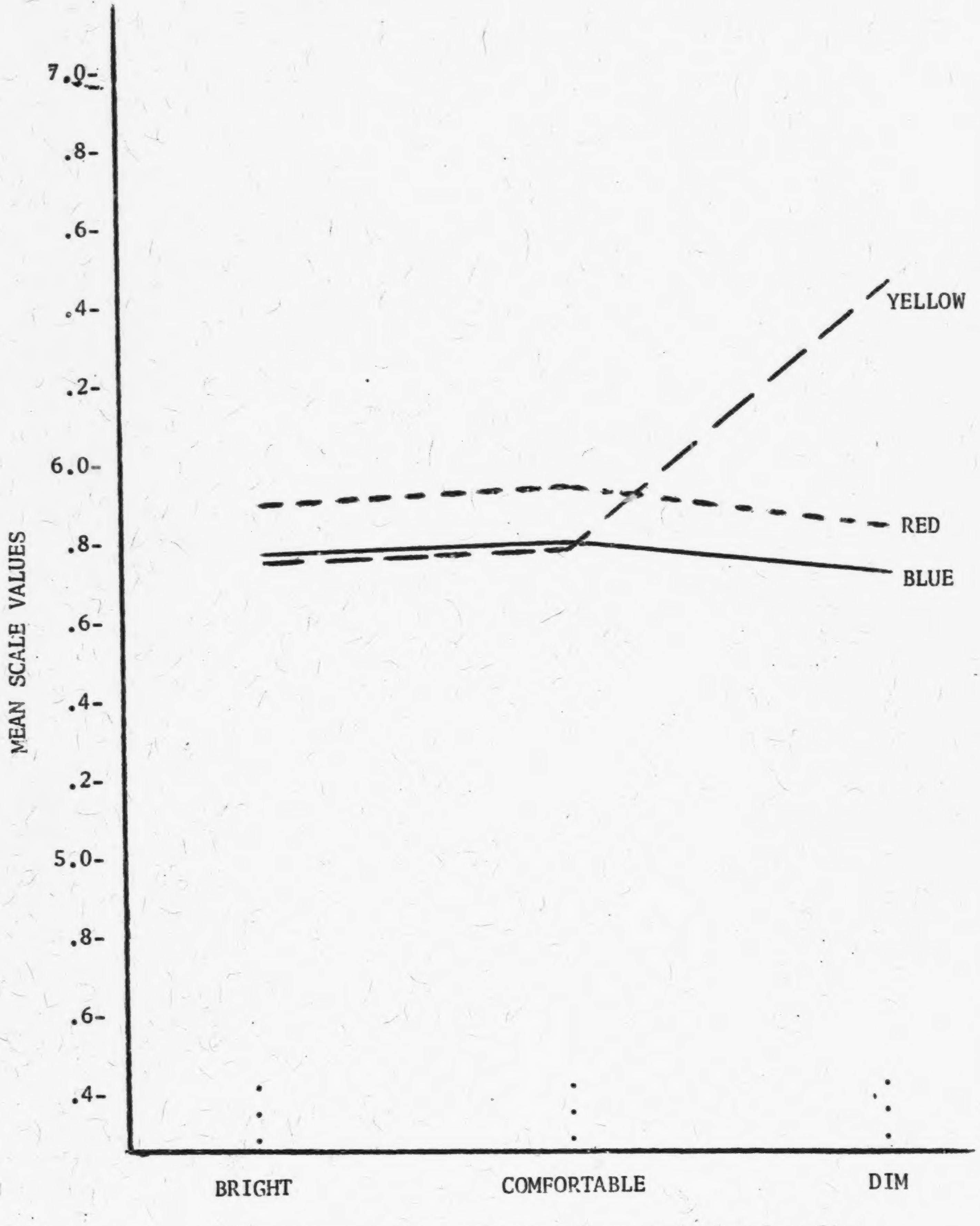

Fig. 5. Mean scale values of intensity ratings under each color condition across illumination levels.

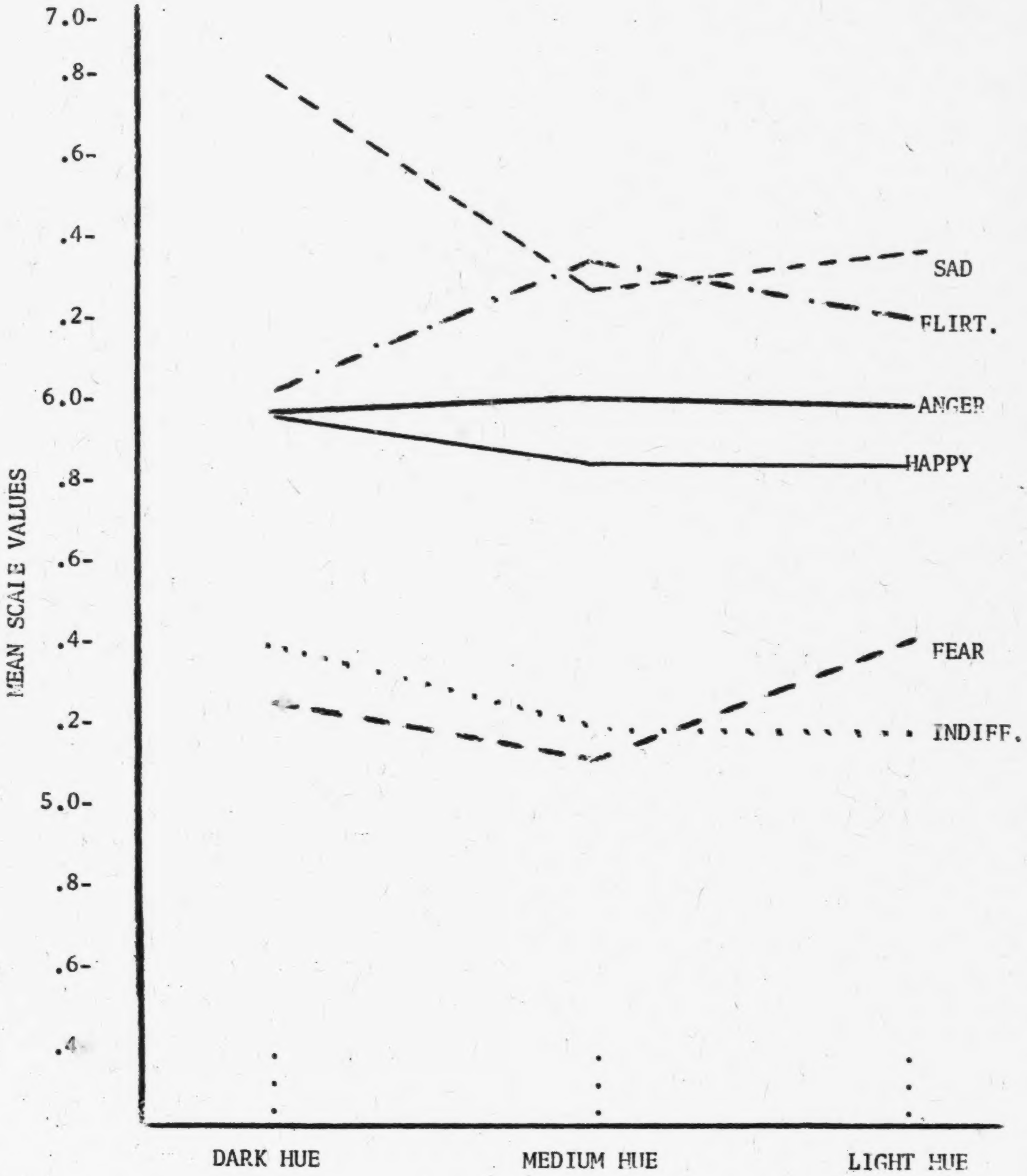

Fig. 6. Mean scale values of intensity ratings of each emotion across hue lightnesses.

Table 15

Analysis of Variance for Mean Sad Responses Across Hue Lightnesses

Source of Variation	df	SS	MS	F
Hue Lightness	2	751,103,100.00	375,555,550.00	32.90**
Ss/Groups	267	3,047,628,250.00	11,414,338.00	
Total	269	3,798,731,350.00		

The mean response to sad for the hue lightnesses differed significantly ($p < .01$).

Another test was made for flirting because the mean response to it varied second most within the same treatment. Table 16 shows that test.

Table 16

Analysis of Variance for Mean Flirting Responses across Hue Lightnesses

Source of Variation	df	SS	MS	F
Hue Lightness	2	107,566.25	53,783.13	2.59
Ss/Groups	267	5,543,881.70	20,763.60	
Total	269	5,651,447.95		

The mean response to flirting did not differ significantly; hence, none of the other emotion means would be expected to differ within this treatment effect.

Figures 7 and 8 show the plotted means for the interaction between hue lightness and color, and hue lightness and illumination respectively. In figure 7, the F test focuses on the change in means for all emotions under dark and light hue environments separately for red, blue, and yellow. Figure 8 shows the mean response under dim lighting across dark, medium, and light hues in the room. The tests, which use light hues and dim lighting as constant conditions respectively, were chosen because of their relatively greater variance over the other levels within hue lightness and illumination respectively. Table 17 shows the analysis of variance for dark hues across color conditions.

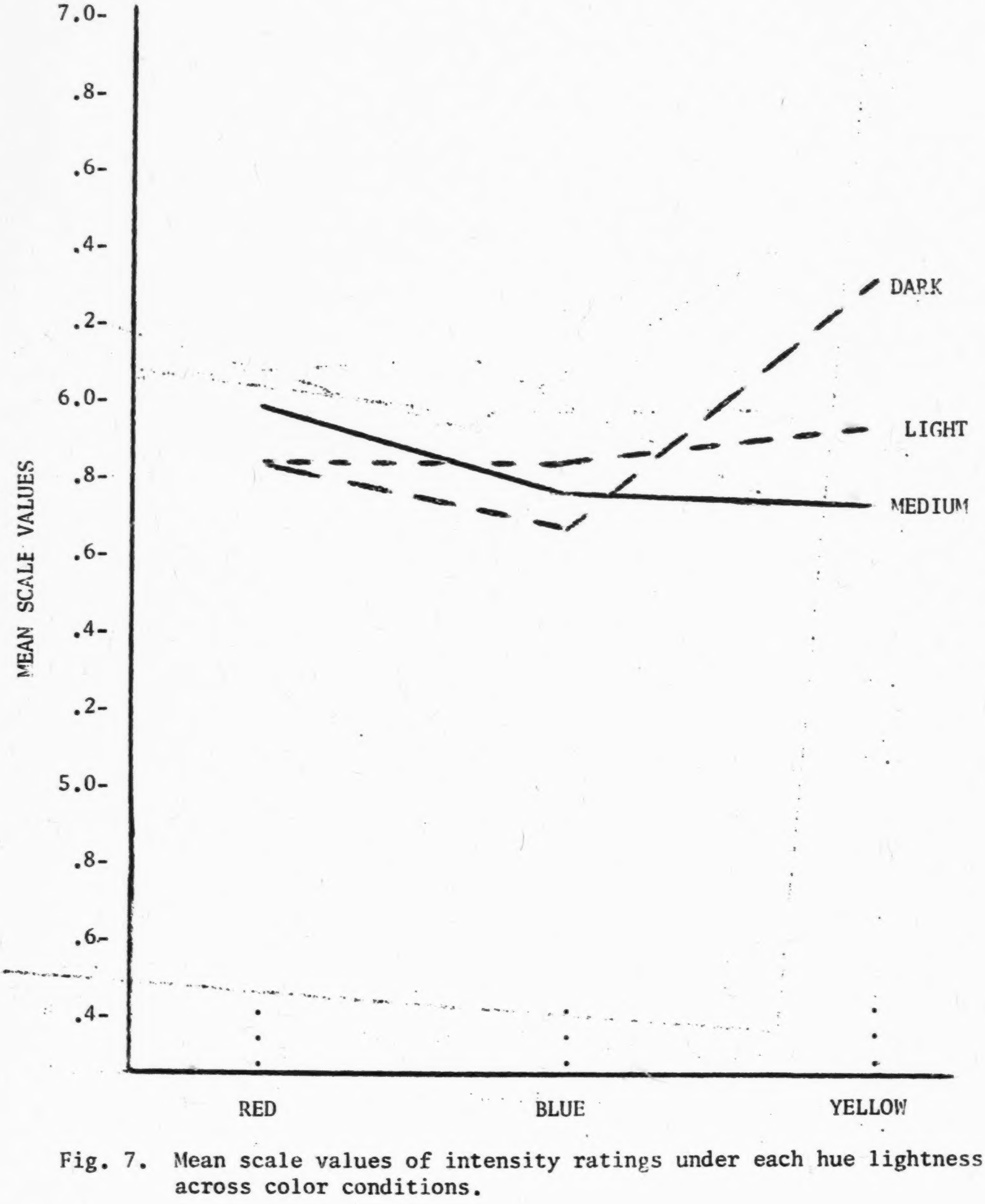

Fig. 7. Mean scale values of intensity ratings under each hue lightness across color conditions.

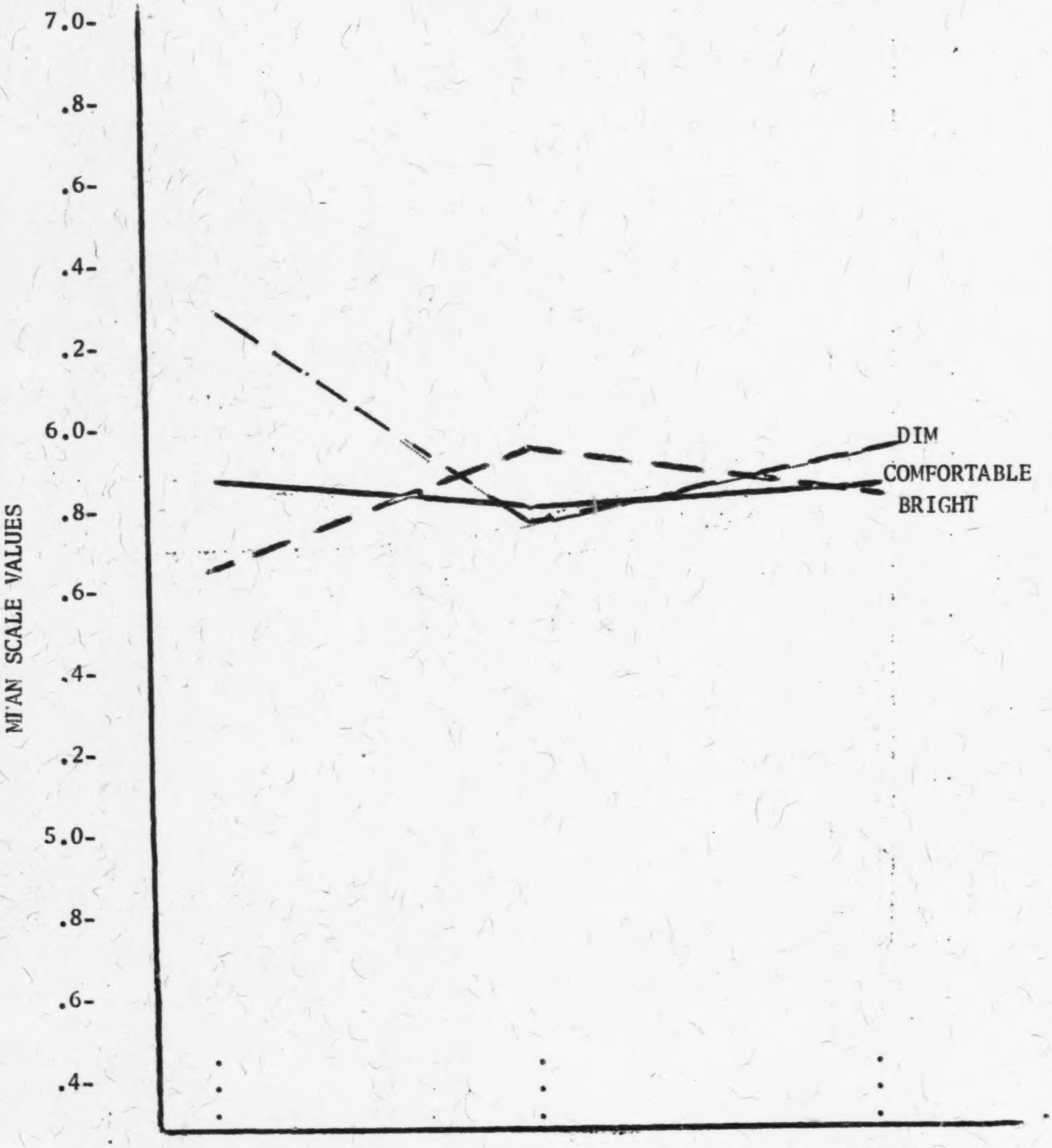

Fig. 8. Mean scale values of intensity ratings under each illumination level across hue lightnesses.

Table 17

Analysis of Variance for Mean Responses under Dark Hues across Color Conditions

Source of Variation	df	SS	MS	F
Color	2	1,140,772.40	570,386.22	1.00
Ss/Groups	87	49,409,181.00	567,921.62	
Total	89	50,549,953.40		

The treatment effect is not significant.

Table 18 shows the F test for responses under the light hues across the colors; and Table 19 shows the same test for responses under dim lighting across hue lightnesses.

Table 18

Analysis of Variance for Mean Responses under Light Hues across Color Conditions

Source of Variation	df	SS	MS	F
Hue Lightness	2	36,092.81	18,046.41	.45
Ss/Groups	87	3,529,755.10	40,571.89	
Total	89	3,565,847.91		

The treatment effect is insignificant.

Table 19

Analysis of Variance for Mean Responses under Dim Lighting across Hue Lightnesses

Source of Variation	df	SS	MS	F
Hue Lightness	2	837,624.72	418,813.86	.72
Ss/Groups	87	50,592,709.30	518,525.39	
Total	89	51,430,337.02		

The mean response across the hue lightness treatment is not significant.

Alternative considerations were made of the three environmental variables. In addition to examining mean score values under dark hues across colors, mean scale responses in yellow rooms across hue lightnesses were analyzed. Figure 9 shows the mean color response for each hue lightness. Table 20 shows the test for yellow responses across the hue lightnesses.

Table 20

Analysis of Variance for Mean Responses under Yellow Conditions across Hue Lightnesses

Source of Variation	df	SS	MS	F
Hue lightness	2	897,065.19	448,532.59	.79
Ss/Groups	87	49,780,463.60	572,189.24	
Total	89	50,677,528.79		

Mean responses in a yellow room across the lightnesses of hue are insignificant.

A similar examination was made between the variables of hue lightness and illumination. In addition to analyzing the mean scale values of each illumination level across hue lightnesses, the mean responses under hue lightnesses across the illumination levels were considered (Figure 10). Table 21 shows the test for mean responses in dark hue rooms across illumination.

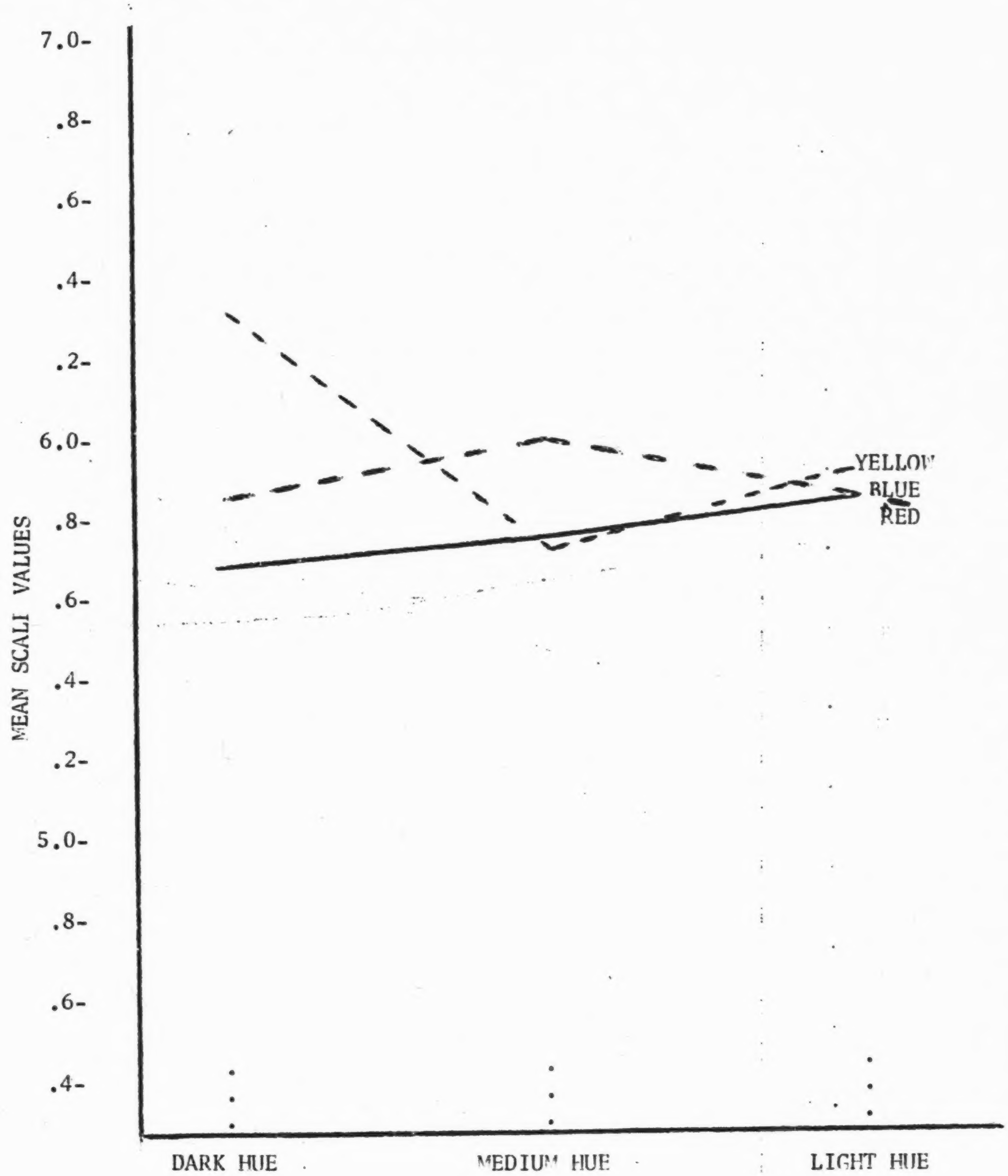

Fig. 9. Mean scale values of intensity ratings under each color condition across hue lightnesses.

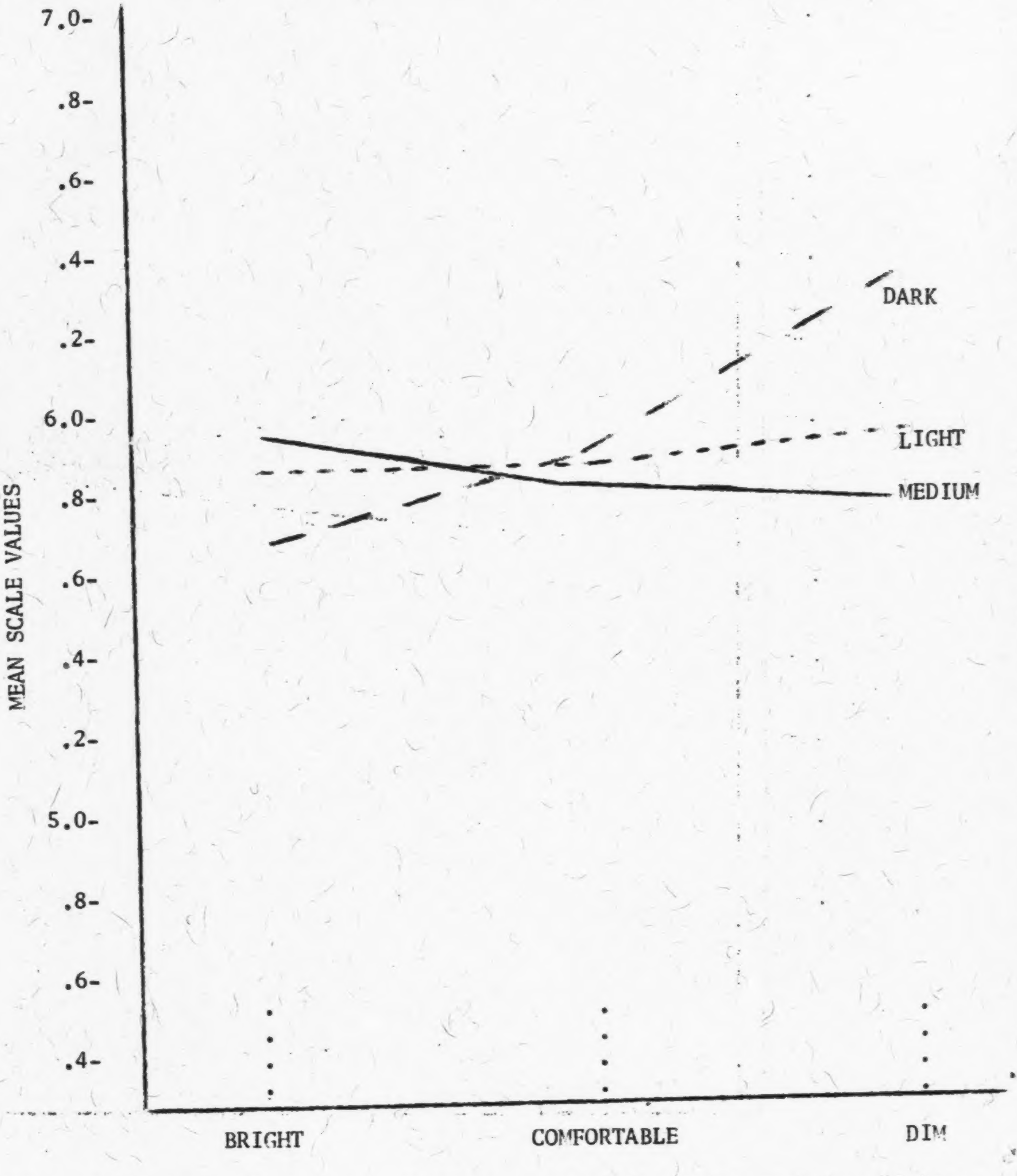

Fig. 10. Mean scale values of rating intensities under each hue lightness across illumination levels.

Table 21

Analysis of Variance for Mean Responses under Dark Hues across Illumination Levels

Source of Variation	df	SS	MS	F
Illumination	2	1,047,935.83	523,967.91	.92
Ss/Groups	87	49,502,020.00	568,988.74	
Total	89	50,549,955.83		

The mean response in dark hue rooms did not vary significantly across illumination levels.

From an examination of possible effects of environmental variables upon the mean response to emotional stimuli, it can be seen that only part (b) of the five parts of the second hypothesis is supported by the data. A significant *F* (p .01) was found for *sad* responses across hue lightnesses with the mean intensity ratings increasing under dark hue environments, as Figure 6 shows. It is recognized that part (b) requires caution when relating results which are so weakly supported to other environments. Nevertheless, *sad* stimuli on the tape recording may serve as a sensitive guide to environment-affect.

An inspection of the plotted means of each treatment effect generates several observations regardless of the failure to find significant *F* ratios. The implications of the observations are discussed in the next chapter. The observations are:

1. The mean response to each emotion differed across color conditions in a similar fashion. With slight exceptions of *flirting* and *fear*, the mean judgment for each emotion was lowest in the blue environments and highest in the yellow environments (Figure 2).

2. The mean judgment of *sad* exemplified and amplified the general trends of the majority of the emotion means (Figures 2,3,6): however, the mean judgment of the other emotions differed very little across environmental conditions.

3. The mean judgment under all three intensities of light assumed the same pattern with the dim level accenting the trend (Figure 4) i. e., there was an inverse relationship between lighting intensity and mean scale rating.

4. The mean judgment under dark hue environments distinguished the levels of the colored environments more than did the medium and light hue environments. Nevertheless, the trends for all three lightnesses were similar (Figure 7).

5. The mean judgment under yellow environments received the highest mean ratings under dark hue and dim illumination environments (Figures 7, 8, 9).

6. The mean judgment under dim lighting distinguished the hue lightness treatment, with the dark hues receiving the highest rating, more than did the bright and comfortable intensities (Figures 8, 10).

Hypothesis 3. The mean judgment of each emotion differs significantly between male and female subjects.

An insignificant $\underline{F}$ ratio was found for a differential sex response in the overall statistical design. However, means were plotted for the interactions between sex and every other independent variable, taken two at a time.

Figure 11 shows the mean response of each sex across the color conditions. Table 22 shows the $\underline{F}$ test for the levels within the color treatment.

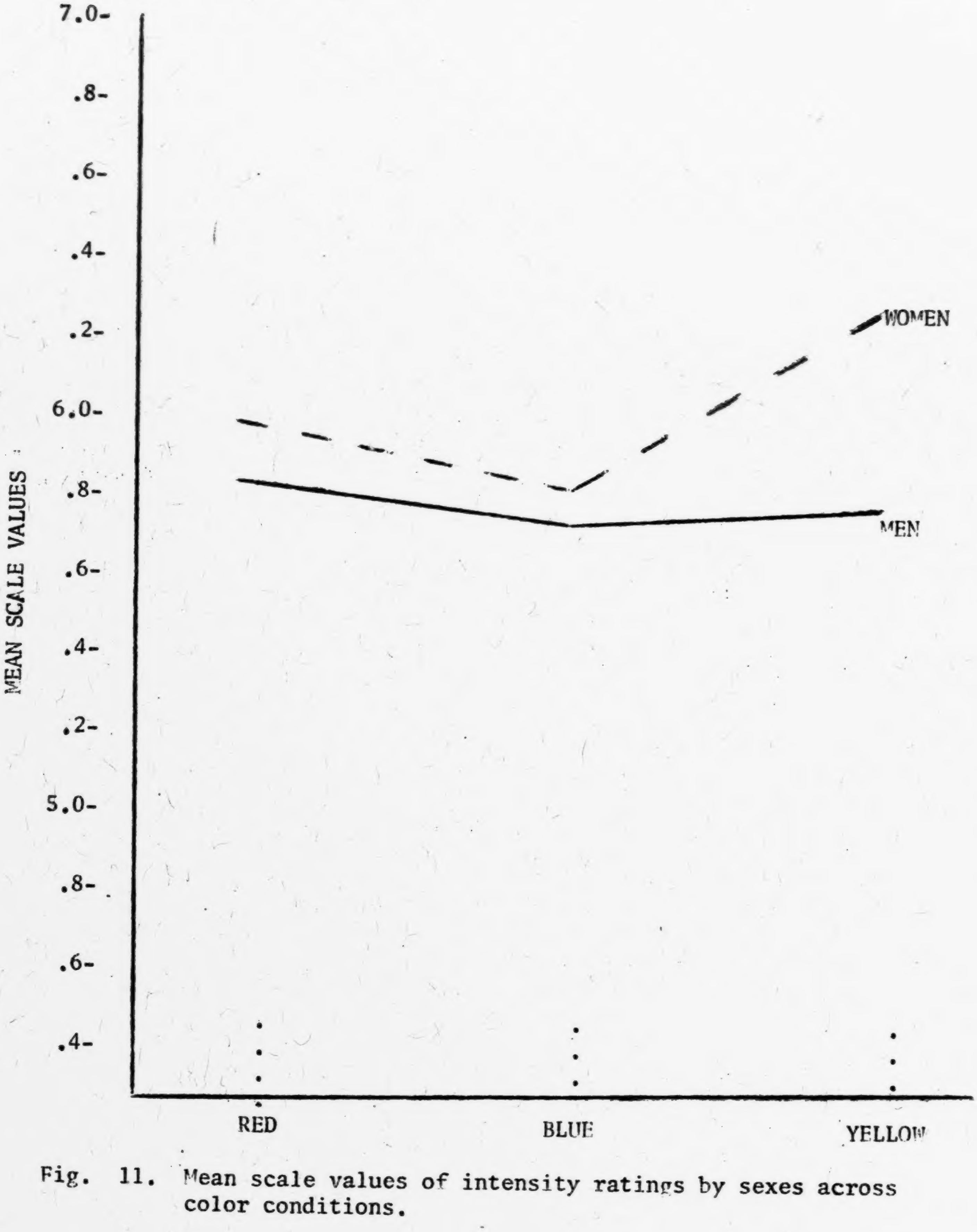

Fig. 11. Mean scale values of intensity ratings by sexes across color conditions.

Table 22

Analysis of Variance for Mean Female Responses
Across Colors Conditions

Source of Variation	df	SS	MS	F
Color	2	851,470.88	425,735.44	1.10
Ss/Groups	132	51,238,224.00	388,168.36	
Total	134	52,089,694.88		

The F is not significant; hence, no test was made for the male response which varied less.

Figure 12 shows a differential of each sex response over time. A F test was made for female responses. Table 23 shows that analysis of variance.

Table 23

Analysis of Variance for Mean Female Responses
Over Time

Source of Variation	df	SS	MS	F
Between	134	51,238,244.00	382,374.80	
Within	270	25,934,071.90	96,052.11	
Time	2	2,488,813.60	1,244,406.80	14.22
Residual	268	23,445,258.30	87,482.30	
Total	404	77,172,295.90		

Female responses varied significantly (p. 01) over time.

The same test was made for the male response. Table 24 shows the results of that analysis of variance.

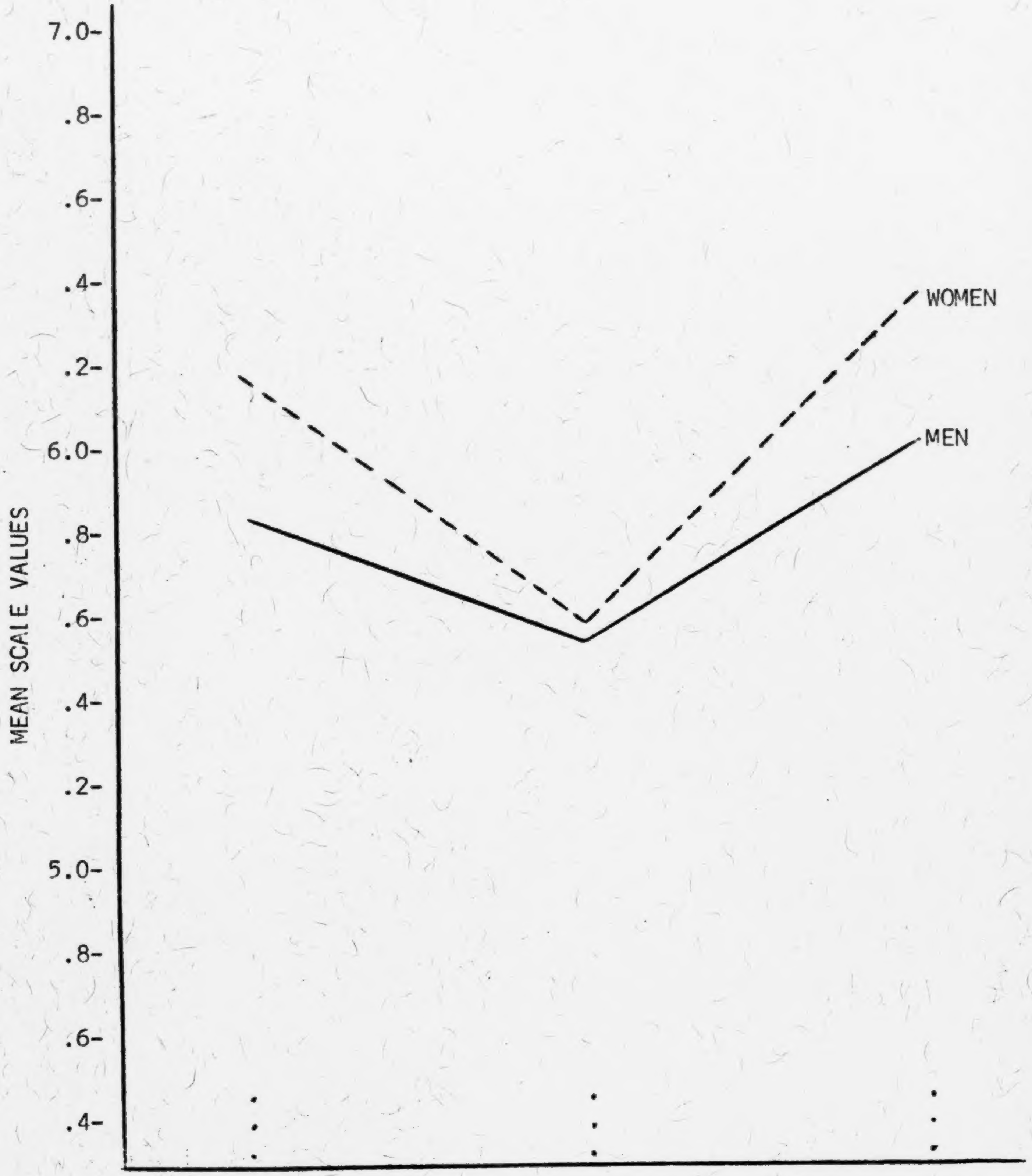

Fig. 12. Mean scale values of intensity ratings by sexes over time.

Table 24

Analysis of Variance for Mean Male Responses
Over Time

Source of Variation	df	SS	MS	F
Between (males)	134	7,876,939.30	58,783.13	
Within	270	6,765,805.84	25,058.54	
Time	2	213,252.14	106,676.07	4.36
Residual	268	6,552,453.70	24,449.45	
Total	404	14,642,745.14		

The mean male response also differed over time (p. 05).

Figure 13 shows the response of each sex to each emotion. A F test was made on the response to sad, because this emotion distinguished the sexes most. Table 25 shows the test.

Table 25

Analysis of Variance for Mean Sex Responses to
Sad Stimuli

Source of Variation	df	SS	MS	F
Sex	1	11,064,227.40	11,064,227.40	5.44
Ss/Groups	134	272,481,160.00	2,033,441.40	
Total	135	283,545,387.40		

The new sex response difference to sad stimuli is significant (p. 05).

Another test was made for the differential sex response to the portrayal of flirting. Table 26 shows the F test.

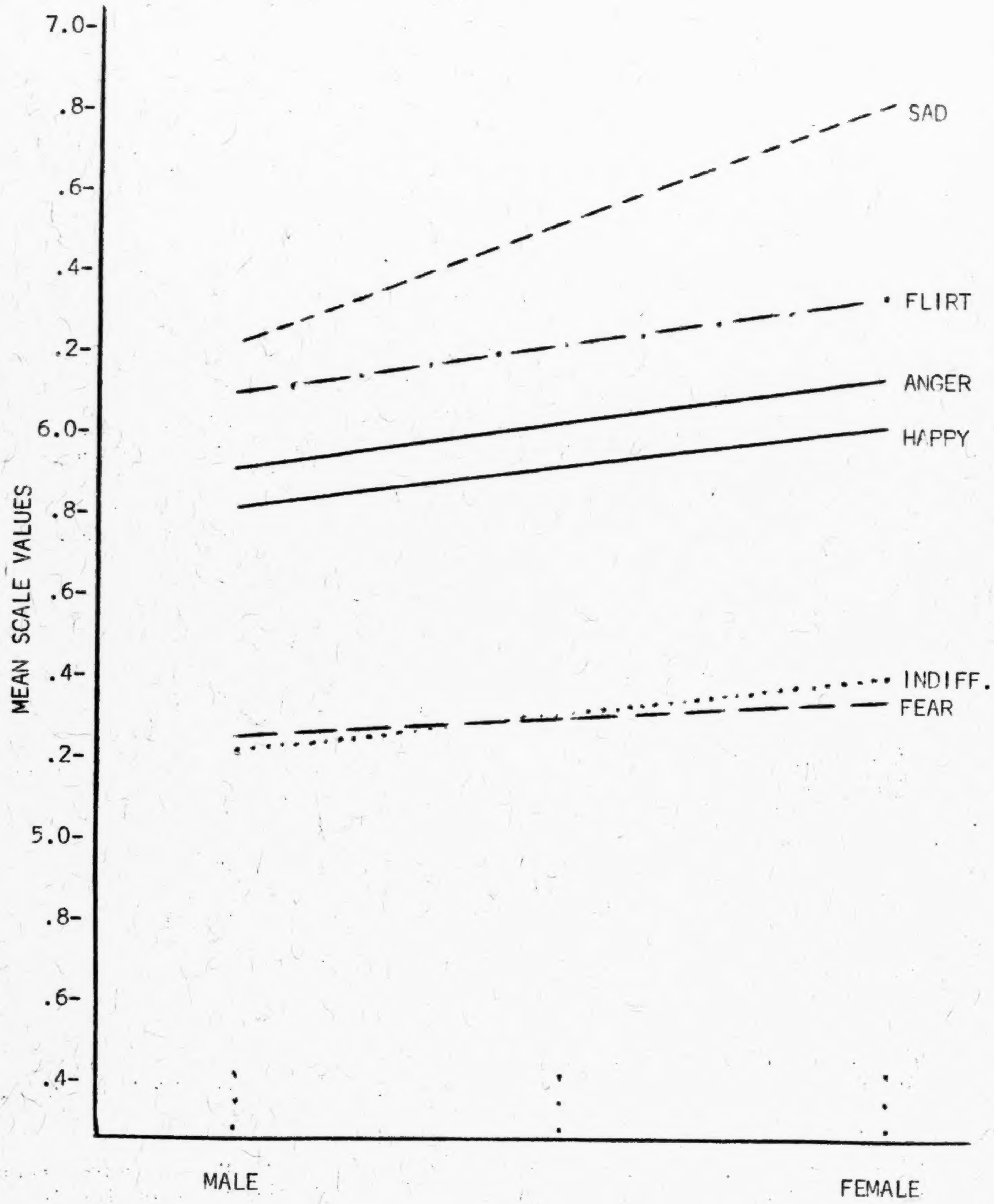

Fig. 13. Mean scale values of intensity ratings for each emotion by sexes.

Table 26

Analysis of Variance for Mean Sex Responses to Flirting Stimuli

Source of Variation	df	SS	MS	F
Sex	1	153,594.64	153,594.64	.91
Ss/Groups	268	45,296,426.00	169,016.51	
Total	269	45,450,020.64		

The differential response to flirting is not significant: hence, sex response differential to other type stimuli are not significant.

Figure 14 shows the response of each sex to the levels within the hue lightnesses. Table 27 shows the F test for the mean response of women across hue lightnesses.

Table 27

Analysis of Variance for Mean Female Responses across Hue Lightnesses

Source of Variation	df	SS	MS	F
Hue lightnesses		508,752.40	254,376.20	.65
Ss/Groups	132	51,580,929.20	390,764.61	
Total	134	52,089,681.70		

The female response did not vary significantly: hence, no test was made for the mean male response.

The last chart in relation to sex differences and the environment (Figure 15) shows the mean sex response across illumination levels. Table 28 shows the results of the analysis of variance.

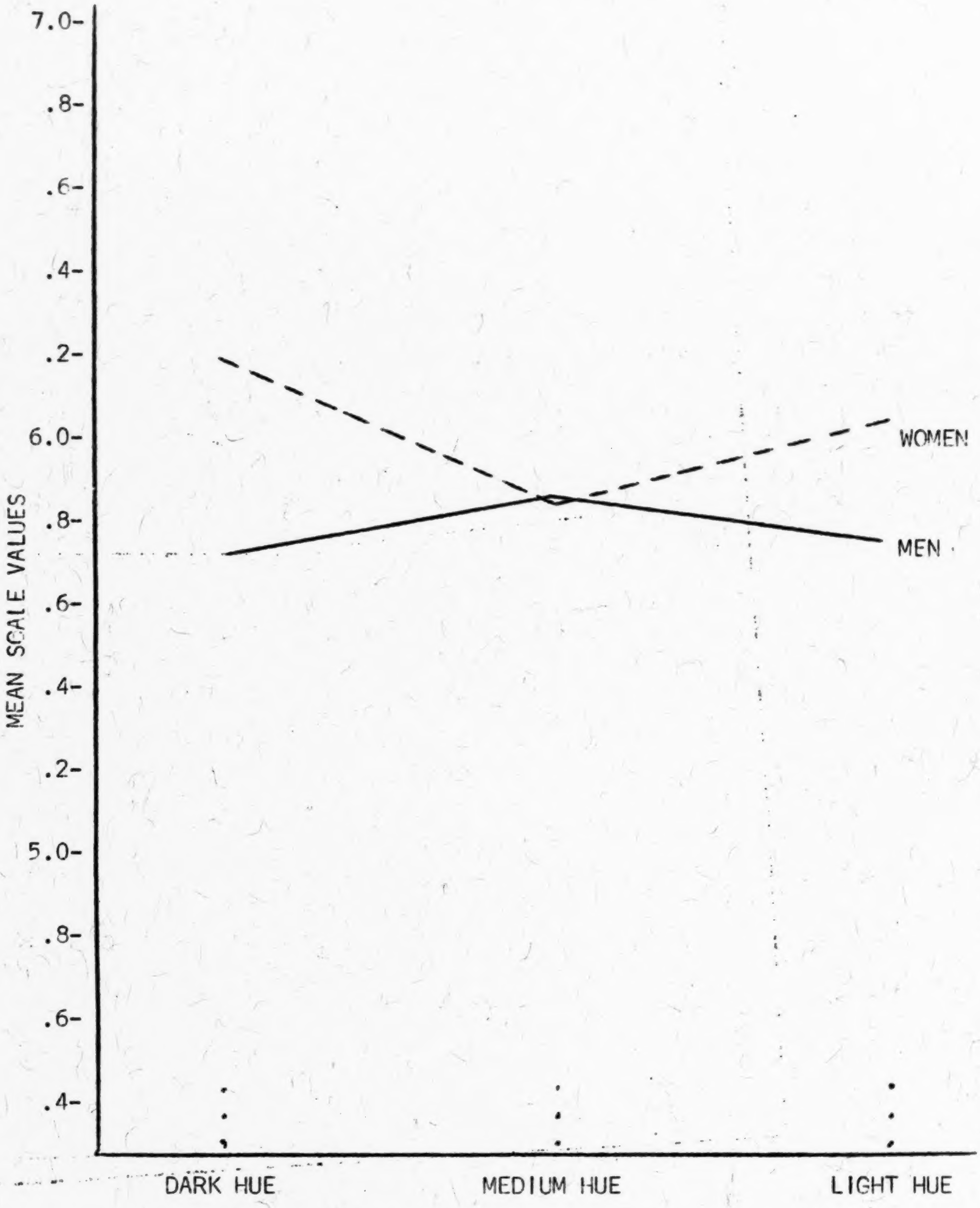

Fig. 14. Mean scale values of intensity ratings by sexes across hue lightnesses.

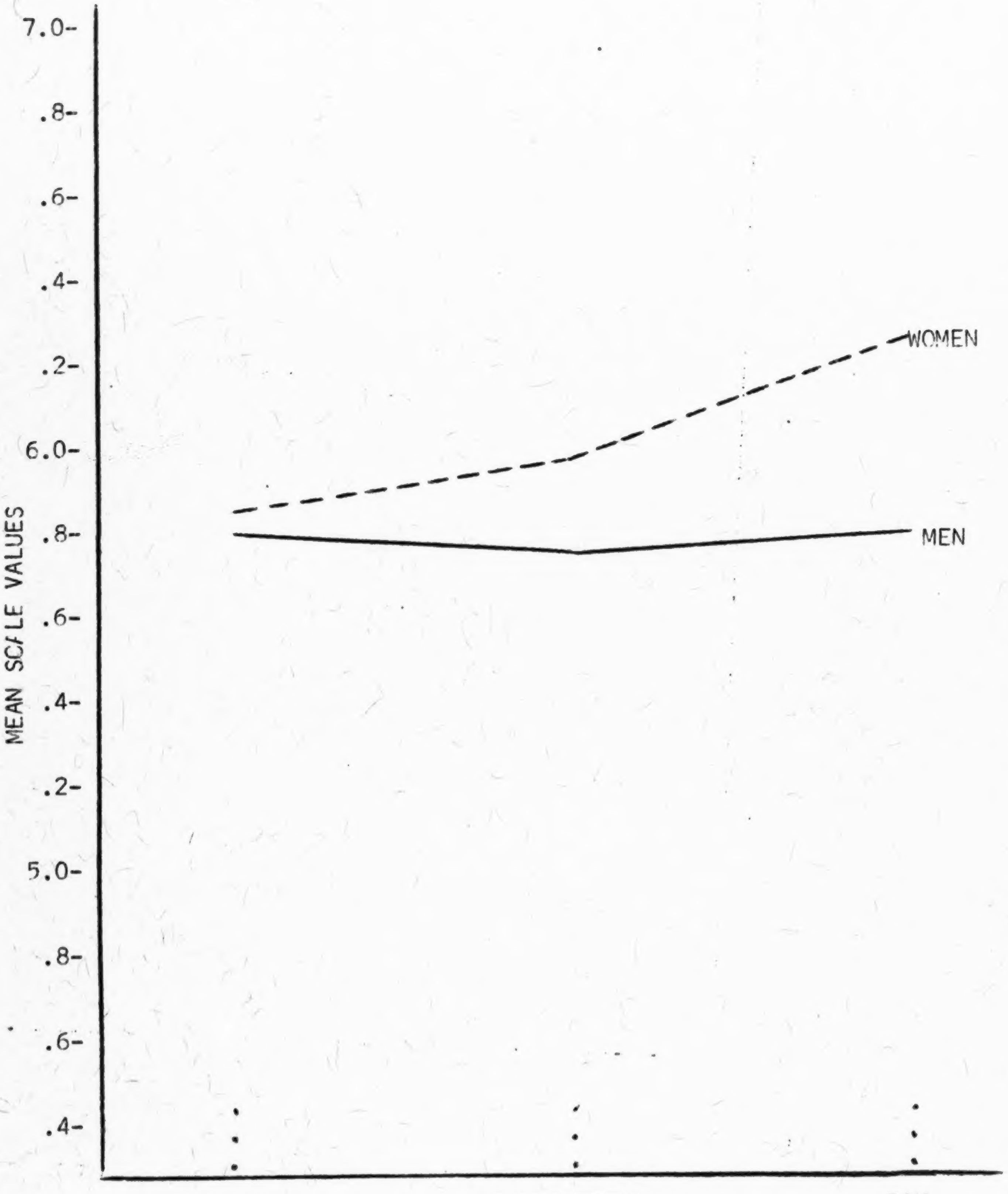

Fig. 15. Mean scale values of intensity ratings by sexes across illumination levels.

Table 28

Analysis of Variance for Mean Female Responses across Illumination Levels

Source of Variation	df	SS	MS	F
Illumination	2	624,358.52	312,176.26	.80
Ss/Groups	132	51,465,336.00	389,888.90	
Total	134	52,089,694.52		

The mean response did not vary significantly; hence, no test was made for the mean male response.

Two *F* tests are significant (the mean judgment of each sex changed over time, and the mean judgment of each sex differed significantly to *sad* stimuli); however, several interesting patterns may be observed regardless of the significance levels. The meaning of these patterns are discussed in the next chapter. The patterns are:

1. The mean judgment of each sex tended to follow similar trends with the female responses accenting the trend (Figures 11, 12, 13, 15).

2. The mean judgment under yellow environments distinguished the responses of each sex the most (Figure 11).

3. The mean judgment of women to every emotion was higher than that of the men (Figure 13).

4. The emotion *sad* distinguished the mean response between sexes more than the other emotion ratings (Figure 13).

5. The mean judgment of each sex acquired divergent forms within the hue lightness levels (Figure 14).

6. Dim lighting distinguished the mean judgment of each sex most. For women, there was an inverse relationship between mean scale ratings and light intensity in the environment (Figure 15).

Hypothesis 4. The mean judgment of each emotion differes significantly with increased exposure of the subjects to the varying conditions.

The data, which took 33 minutes to obtain from each subject, were analyzed in terms of three sequential time periods: (1) the first 68 phrases, (2) the second 68 phrases, and (3) the last 68 phrases.

The analysis of variance for all the independent variables (Table 10) shows significant *F* ratios for a change in the mean judgment over time, and the interaction between the time and emotion variables. Figure 16 shows the plotted means of the time-emotion interaction.

To analyze the interaction, it is necessary to observe each emotional category separately. The mean judgment of each emotion differed significantly (p. 01) from one another: and each changed significantly (p. 01) over time. Three patterns may be observed. First, the emotions *sad*, *happy*, and *fear* received considerably lower mean intensity ratings after 22 minutes than they had after 11 minutes, but by the end of the session, the trend reversed. The second pattern is the response mean to *flirting*, which approximates a trend opposite to that of the plotted means for *sad*, *happy*, and *fear*. The third pattern shows the means for *anger* and *indifference* approaching trends with the former continued upwards and the latter downwards.

A number of factors may induce these changes. Fatigue, anticipation of the session's end, changes in the stimuli, and the environment--or perhaps a combination of them all. The possibility that the stimulus items in the tape changed in consistent directions, i.e., during one block of minutes the emoted intensities were low, and during another block the emoted intensities were high, may be largely ruled out. The items in the tape, although varying greatly in quality of emotional portrayals, were nevertheless randomized in order: hence, in theory, the groupings of low or high intensity portrayals would be eliminated. Additionally, it may be observed that during the final time period the mean ratings of each emotion, except for *flirting* and *indifference* increased sharply. It seems logical that if there is a tendency for emotional portrayals to be perceived as being more intense after 33 minutes, then the perception of *indifference* would diminish, because it too would seem to contain emotion.

To investigate possible meaningful influences of the environment over time, the mean judgment under varying color conditions, hue lightnesses, and illumination levels over the 33 minute session was plotted. Figure 17 shows the mean judgment under color conditions over time. Yellow, which has a mean rating higher than the other colors at the end of 11 minutes, diminished rapidly, becoming insignificantly different from the mean judgment under the other color conditions after 22 minutes.

The mean yellow and red response were subjected to analyses of variance. Tables 29 and 30 show the results of these analyses.

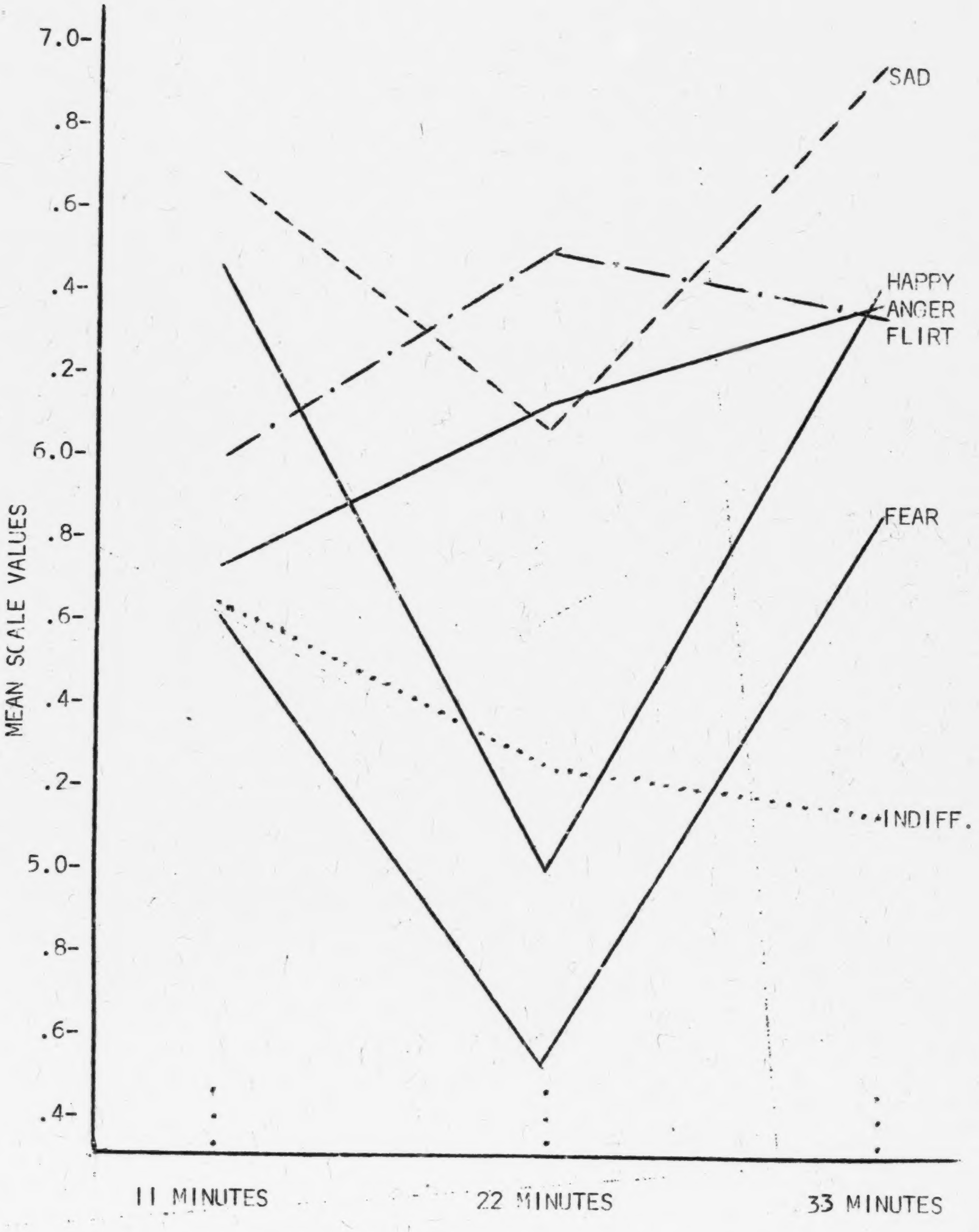

Fig. 16. Mean scale values for intensity ratings of each emotion over time.

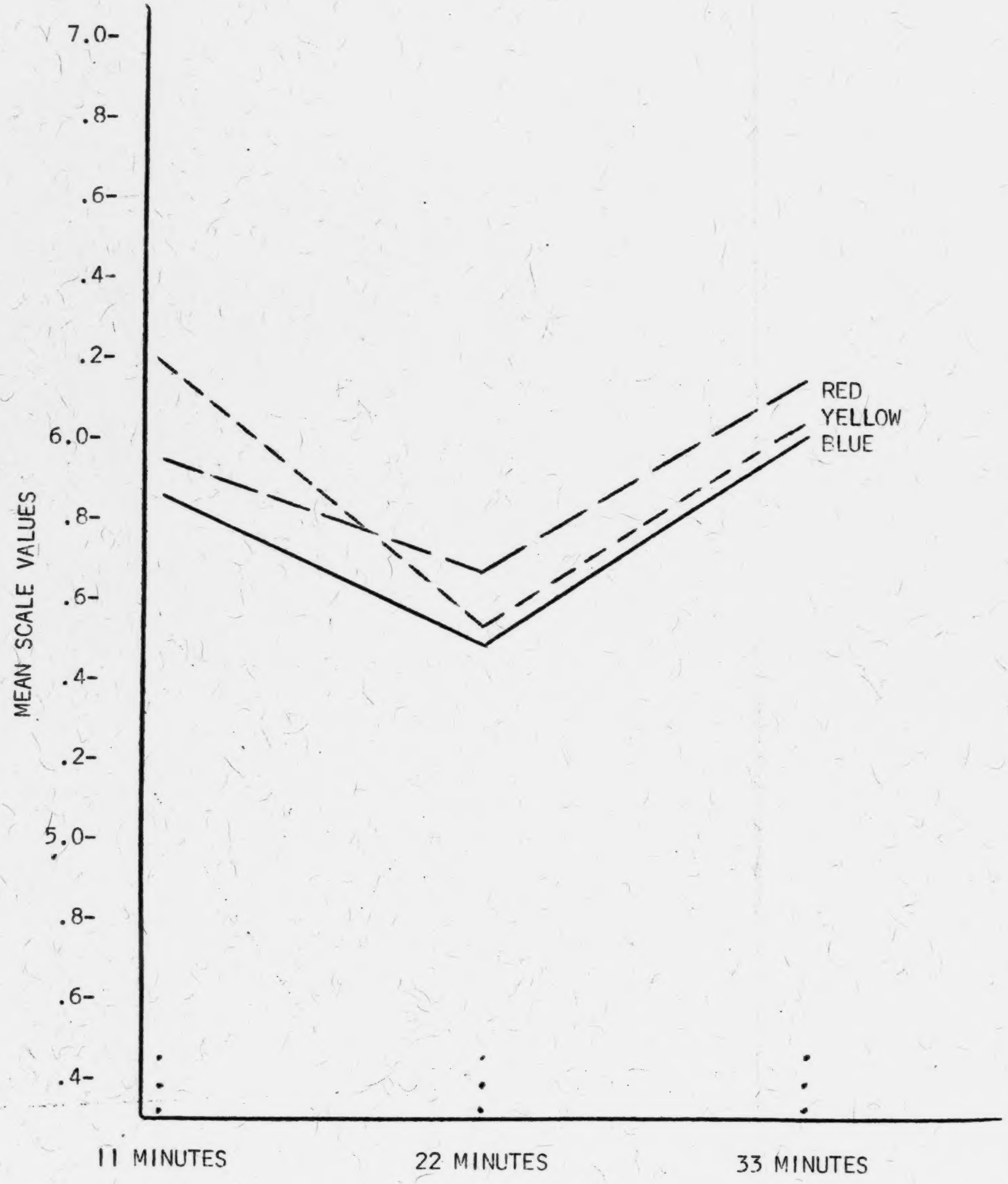

Fig. 17. Mean scale values of intensity ratings under each each color condition over time.

Table 29

Analysis of Variance for Mean Responses under Red Conditions over Time

Source of Variation	df	SS	MS	F
Between (Red)	89	4,063,917.50	45,661.99	
Within	180	4,858,189.35	26,989.94	
Time	2	143,489.35	71,744.68	2.71
Residual	178	4,714,700.00	26,487.09	
Total	269	8,922,106.85		

The mean response in red rooms did not differ significantly.

Table 30

Analysis of Variance for Mean Responses under Yellow Conditions over Time

Source of Variation	df	SS	MS	F
Between (Yellow)	89	50,677,528.00	569,410.44	
Within	180	25,241,833.20	140,232.40	
Time	2	2,059,419.20	1,029,709.64	7.91**
Residual	178	23,182,414.00	130,238.28	
Total	269	75,919,361.20		

The mean judgment in yellow rooms differed (p. 01) over time.

Another examination was made of the mean response under each hue lightness over time (Figure 18). Analysis of variance tests were computed for dark, medium, and light hue lightnesses. Tables 31, 32, and 33 show these tests.

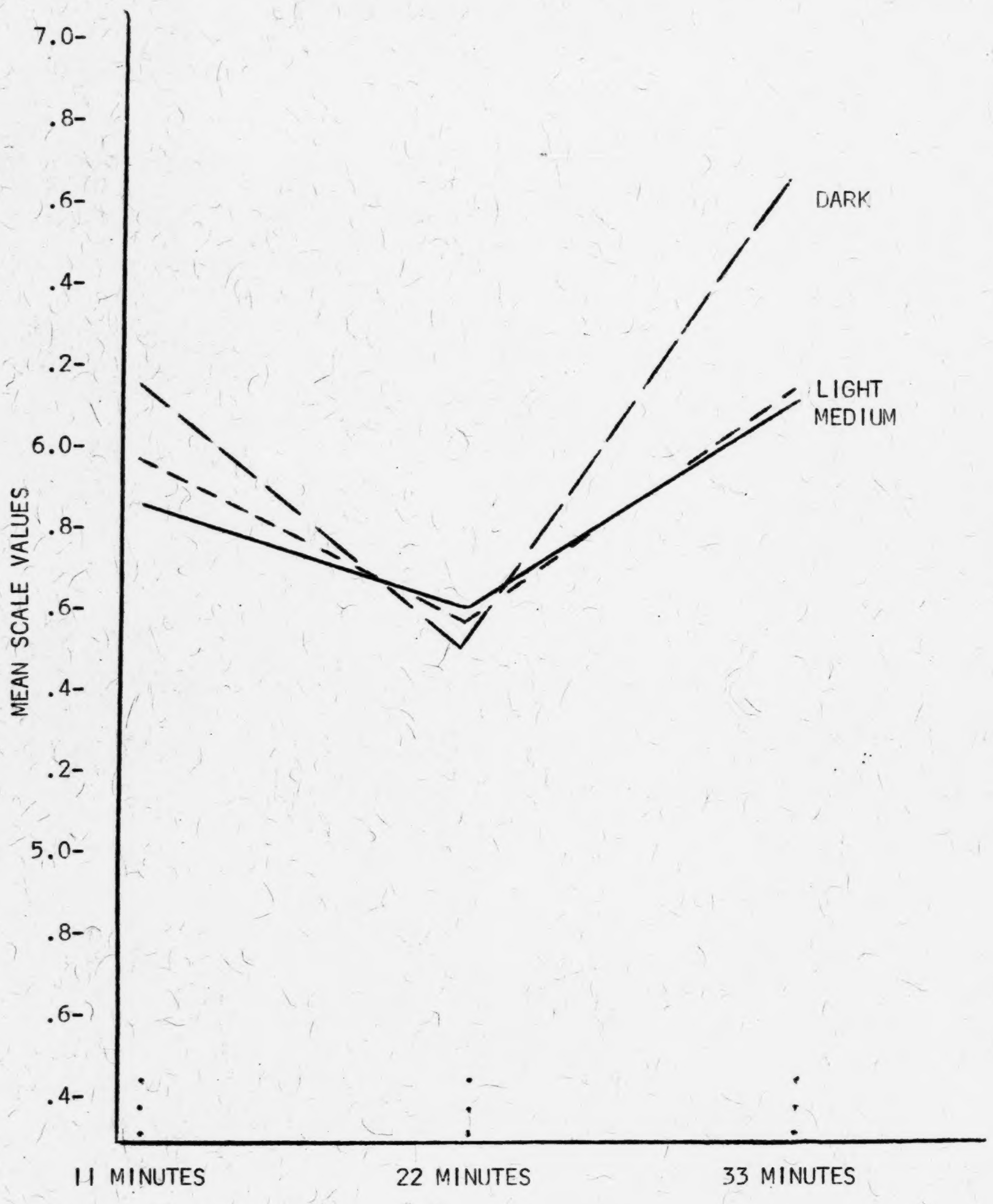

Fig. 18. Mean scale values of intensity ratings under each hue lightness over time.

Table 31

Analysis of Variance for Mean Responses under Dark Hue Lightness over Time

Source of Variation	df	SS	MS	F
Between (Dark Hues)	89	50,549,959.00	567,977.07	
Within	180	25,314,872.90	140,637.93	
Time	2	1,771,215.90	885,607.97	6.70**
Residual	178	23,543,657.00	132,267.74	
Total	269	75,864,831.90		

Mean responses varied over time (p. 01).

Table 32

Analysis of Variance for Mean Responses under Medium Hues Lightness over Time

Source of Variation	df	SS	MS	F
Between (Medium)	89	4,467,662.50	50,198.45	
Within	180	5,973,967.22	33,188.55	
Time	2	416,461.22	208,230.61	6.67**
Residual	178	5,557,506.00	31,221.94	
Total	269	6,441,629.72		

Mean responses under medium hues varied over time (p. 01).

Table 33

Analysis of Variance for Mean Responses under Light Hues over Time

Source of Variation	df	SS	MS	F
Between (Light Hues)	89	3,130,458.70	35,173.69	
Within	180	4,368,319.56	24,268.72	
Time	2	313,083.46	156,541.73	6.89**
Residual	178	4,055,236.10	22,782.22	
Total	269	7,498,778.26		

Mean responses under light hue environments varied over time (p. 01).

A third examination was made of the mean responses under each illumination level over time. Figure 19 shows that the means under dim lighting varied the most, but the pattern was consistent for all levels. F tests were computed for each level of lighting. Tables 34, 35, and 36 show the results.

Table 34

Analysis of Variance for Mean Responses under Dim Illumination over Time

Source of Variation	df	SS	MS	F
Between (Dim Light)	89	51,430,345.00	577,869.05	
Within	180	25,417,275.50	141,207.08	
Time	2	1,900,601.50	950,300.76	7.19**
Residual	178	23,516,674.00	132,116.14	
Total	269	76,847,620.50		

Mean responses under dim lighting varied over time (p. 01).

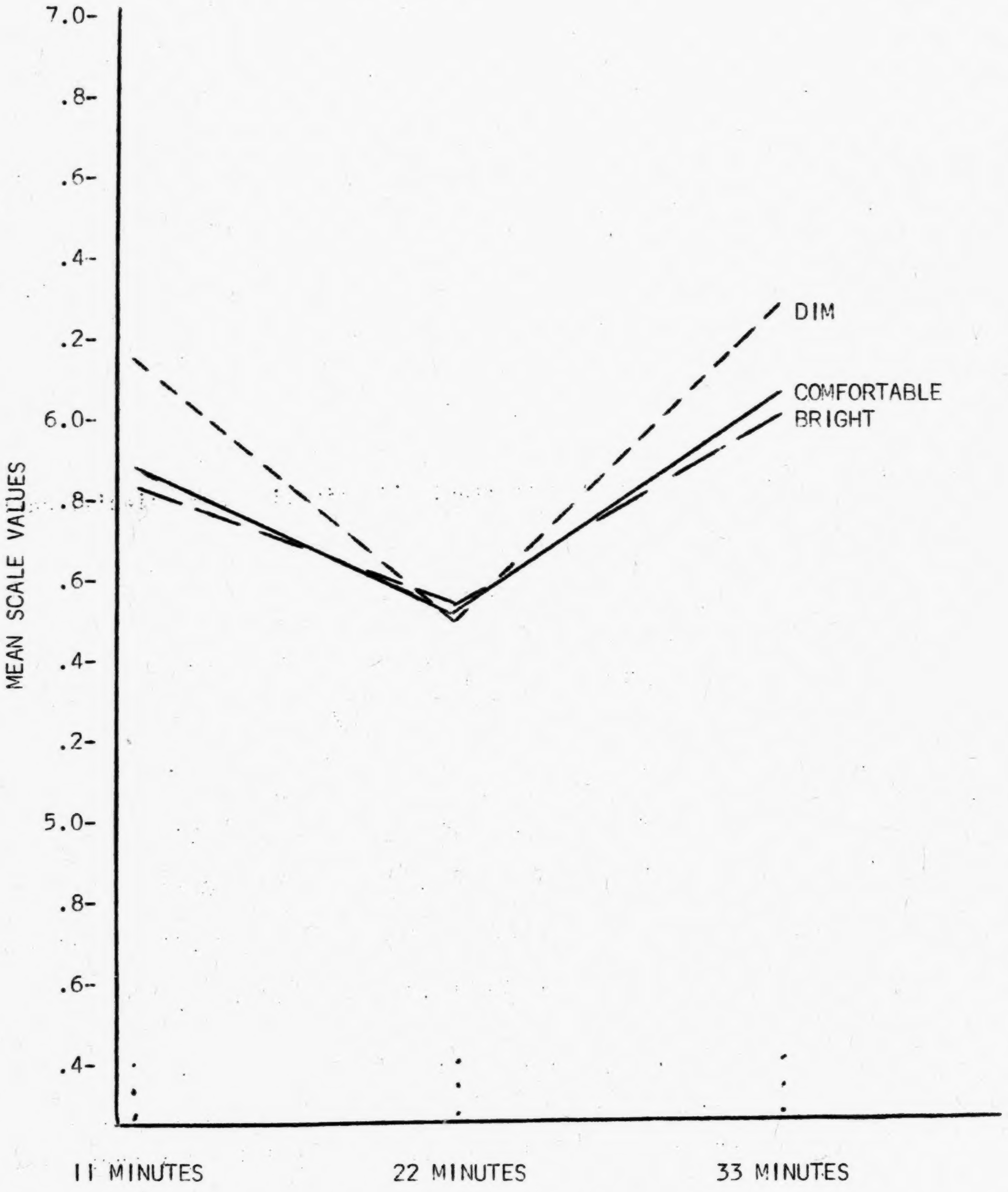

Fig. 19. Mean scale values of intensity ratings under each illumination level over time.

Table 35

Analysis of Variance for Mean Responses under
Comfortable Illumination over Time

Source of Variation	df	SS	MS	F
Between (Comfortable Illumination)	89	3,724,536.70	41,848.72	
Within	180	1,897,012.90	10,538.95	
Time	2	841,012.20	420,506.10	70.72**
Residual	178	1,056,000.70	5,932.59	
Total	269	5,621,549.60		

The mean responses under comfortable illumination were significantly different (p. 01).

Table 36

Analysis of Variance for Mean Responses under
Bright Illumination over Time

Source of Variation	df	SS	MS	F
Between (Bright)	89	5,393,588.00	60,602.11	
Within	180	3,665,363.79	20,363.13	
Time	2	605,555.59	302,777.79	17.60**
Residual	178	3,059,808.20	17,189.83	
Total	269	9,058,951.79		

The mean response under bright illumination significantly varied over time (p. 01).

It can be seen that the mean scale response varied significantly over time under several of the experimental conditions. However the mean response may vary regardless in what environment the subject finds himself, given that he is presented with the same task. To meaningfully relate the time effect to the environment, differential mean responses within each time segment would have to be analyzed for the color conditions, the hue lightnesses, and the illumination levels. Figures 20, 21, and 22 show how during each time segment the mean response varied across colors, hue lightnesses, and illumination respectively. In each figure, a test was considered for the treatment showing the greatest mean scale change. Figure 21 shows that between the second and final time period (22 to 33 minutes), the mean response across hue lightnesses varied the most. A test was made for this treatment effect (Table 37).

Table 37

Analysis of Variance for Mean Response During the Third Time Segment across the Hue Lightnesses

Source of Variation	df	SS	MS	F
Hue Lightness	2	837,887.85	418,943.93	1.00
Ss/Groups	87	34,211,554.40	393,236.25	
Total	89	35,049,442.50		

The mean response during the third segment of time did not differ significantly. Since the mean response did not differ across the hue lightnesses, it was felt that no further tests would show significance since the mean scale responses varied even less. That no significant trends can be found in Figures 20, 21, and 22, indicates a strong likelihood that the environment did not bring about the mean scale changes over time.

The illustrations and significance tests of the relationship between the environment and time lead to some observations. They are:

1. Yellow seems to be the only color which may effect perception such that emoted items appear more intense than they do in red or blue environments. The mean response under red and blue conditions differed from one another little throughout the session. However, the yellow room effect diminished to an insignificant level after the first third of the session. Conversely, after the first 11 minutes, the mean response under all color conditions became similar and changed very little (Figures 17 and 20).

2. All the hue lightnesses and illumination levels varied over time with the patterns being amplified by dark hues and dim lighting respectively (Figures 18 and 19).

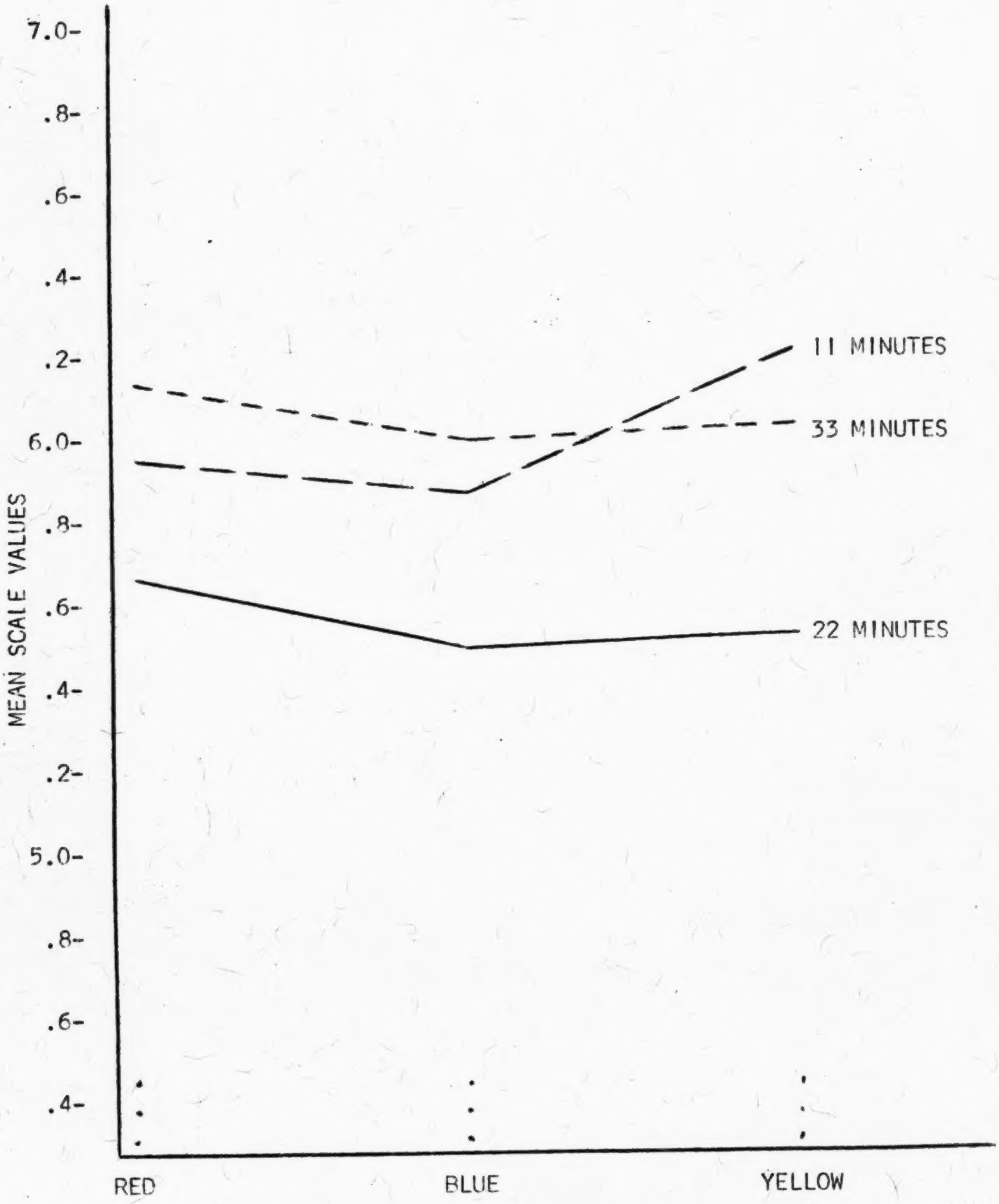

Fig. 20. Mean scale values of intensity ratings during each segment of time across color conditions.

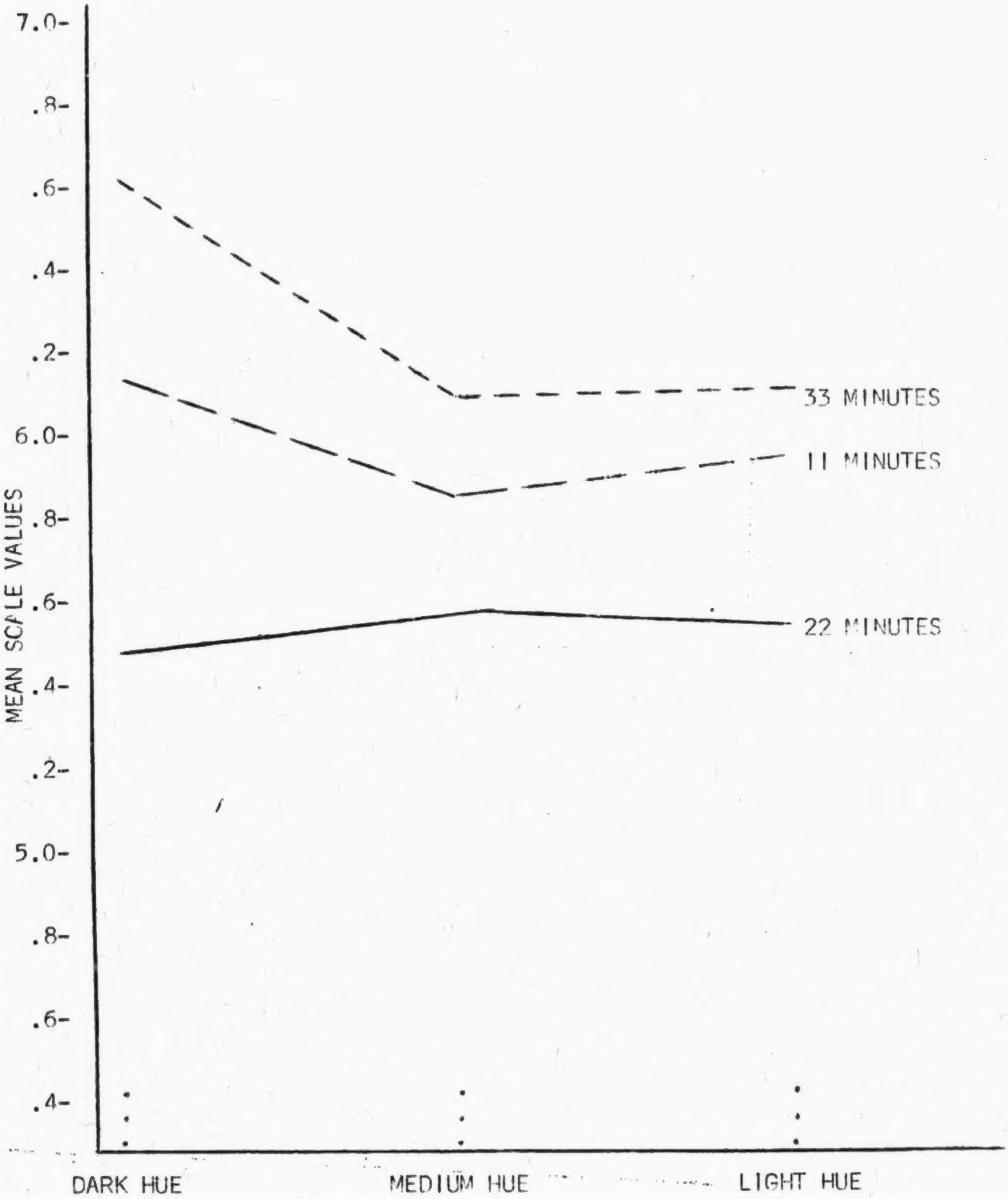

Fig. 21. Mean scale values of intensity ratings during each segment of time across hue lightnesses.

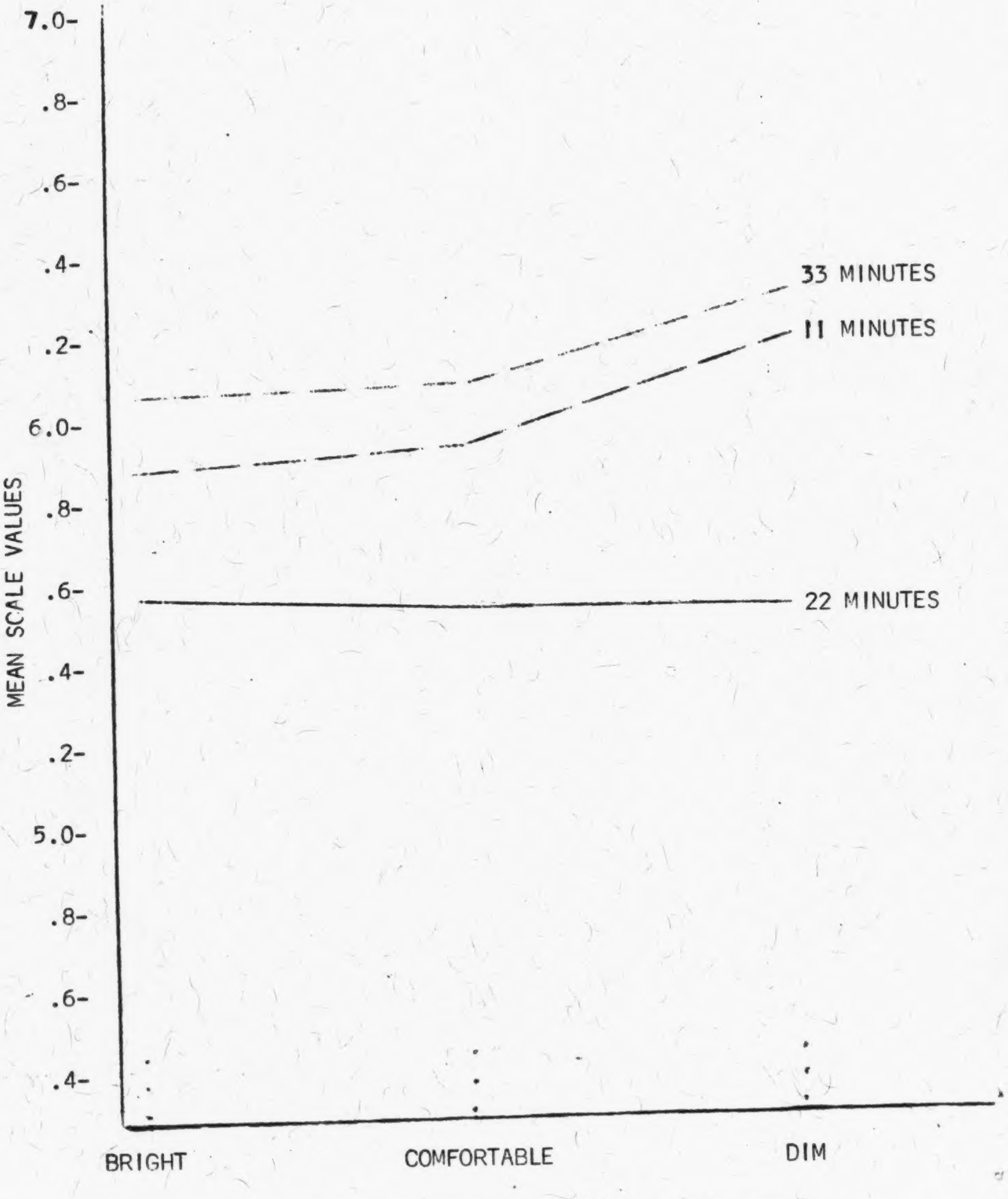

Fig. 22. Mean scale values of intensity ratings during each segment of time across illumination levels.

3. Except in the case with mean responses in yellow environments, the response pattern over time took on a symmetrical form, decreasing at first and then increasing (Figures 17, 18, and 19).

4. The first and third time segments showed similar mean response differences across hue lightnesses and illumination levels with the effect becoming slightly more acute during the final segment, whereas during the middle of the session response changes with variations of hue lightness and illumination were almost non-existent (Figures 21 and 22).

The implications of these observations are discussed in Chapter VI.

CHAPTER VI

DISCUSSION

Two of the four stated hypotheses of this thesis were not confirmed; there were no significant differential changes in the mean intensity ratings of emotions with variations of color, hue lightness, and illumination within the same enviromental space. The third hypothesis on differential judgments by sex was confirmed in part; and the fourth hypothesis on differential judgments over time was confirmed in full. Since environmental variables failed to significantly influence the intensity ratings according to the statistical model used, it is questionable whether the differential mean judgments between the sexes and over time can be meaningfully related to aspects of the physical environment.

To manipulate environmental variables and fail to alter human behavior to a significant degree can be explained in one of three ways:

1. Human perception of emotional portrayals, regardless of sex, is not effected by changes of color and light within the environment.

2. The dependent variable is too insensitive for showing behavioral changes in the time allowed, but with increased exposure, the trends could become significant.

3. The dependent variable is an insensitive measure of behavioral differences among varying environments, and alternative means are to be sought. These alternatives are discussed in order.

Perception of Emotional Portrayal is Uneffected by Light and Color

In the first chapter, research related to the association of color and light to emotion was reviewed. The current study introduced five major differences between it and previous studies, which are (1) Investigating the relationship of color and light to the interpretation of an emotional experience, (2) systematically manipulating painted hues with achromatic lighting and observing behavioral changes, (3) not bringing the subject's attention to the independent variables and selecting out those who indicated knowledge of them, (4) investigating the emotional significance of achromatic lighting, and (5) introducing time as an independent variable with color and light. The literature review consistently reported definite tendencies to associate particular colored chips and chromatic lighting with particular emotional feelings; and further, that arrangements of color and lighting can produce certain emotional climates. Hence, if the body of data from previous investigations is not to be ignored, it would seem that alternative measures might be sought to show behavioral differences and, perhaps, different experimental approaches be employed. Such alternative possibilities are discussed later.

Based on the listed observations in relation to each hypothesis, separate directions might be investigated for each of the environmental variables. Color in the environment seems to effect emotional perception in an increasing linear fashion as the hues move from blue to yellow through red in the Ostwald color circle. A test of this principle would include variations between the primary colors and would complete the circle from yellow through green to blue.

Dark hues have a greater effect on emotional perception than the medium and light hues, which brought about little change across conditions. Dark hues in the environment may well amplify color and light effect, differentiate sex responses, and induce a variety of behaviors over time. On the other hand, the smallest amount of white added to the pure hue may rapidly diminish the environmental influences. Similarly, dim lighting brought about mean response differences while bright and comfortable lighting did not. For both hue lightness and illumination, it would seem fruitful to explore those areas between the dark and meduim lightnesses and the comfortable and dim lighting to discern at what point human perception may be significantly influenced and at what point the influence suddenly vanishes.

The light range in the present experiment was somewhat limited with the comfortable lighting condition closer in foot candle units to the bright level than the dim level, and the distance between bright and dim lighting being not too large. Hence, possible avenues of research on the relationship between emotions and achromatic lighting, stemming from the present results, would have to be highly qualified. Nevertheless, the response patterns to the bright and dim levels may very well hold up and apply to illumination of even greater intensity.

In order to investigate any of the above principles, only one emotion (sad) need be used, because sad stimuli appear not only to characterize response differences of the other emotions to the varying conditions, but also to accent the response differences. Subjects for experiments bearing on the first and third principles need only be women, because sex response patterns are alike in form but differ in acuteness of response variance across environments. Women tend to perceive emotional portrayals as being more intense than do the men. For an experimental consideration of the second principle, sex differences would have to be investigated, because the female response pattern decreased at first and then increased as the environmental stimuli changed from pure hue to hues with increasing amounts of white, whereas the male response pattern followed the reverse trend by increasing at first and then decreasing.

The Dependent Variable May Be Sensitive Enough for Measures over an Extended Period of Time

The writer's concern with time as a variable is twofold. First, as already mentioned, a frequent lacking in environmental research is the inclusion of time as either an independent or dependent variable.

In the present experiment, time is treated as an independent variable where the mean interpretation of judged intensity of an emotion is recorded across three time periods. Although the subject was exposed to emotional stimuli for 33 minutes, which by no means characterizes this study as longitudinal, there is nevertheless an effort to examine possible differences in human perception through time. Previous environmental studies have either ignored time as a variable or provided an average for one time period (Sommer, 1966). Design of the human environment tends to be lasting. To measure human reactions at only one moment may be misleading for two reasons. First, the human being has considerable flexibility when adapting, which may be sufficiently subtle to elude rigorous measurement, except, perhaps, for physiological investigations (Gerard, 1958), Second, effects may accumulate, as pointed out by Carson (1967) becoming measurable and important in time, whereas little could be discerned initially.

In the present study, there are data which support in part the priniciple that the effects of the environment accumulate, as is true in much of human behavior. For all the other independent variables, the mean response decreased after the first 11 minutes and then increased, virtually canceling out the effects of the first 22 minutes. The patterns are consistent with the levels of each variable, but with each variable, one particular level accented the trend, e.g., yellow conditions, dark hues, dim lighting, female responses, and responses to sad emotions.

Further research into the time effect would be more valuable in a longitudinal context. Man adjusts readily and rapidly. Little is known about his compensating mechanisms either physiologically or psychologically to the change or lack of change in his environments. In a longitudinal study, frequent measures could be made in a sound, rigorous manner and the subject would not have to react under contrived circumstances.

Use of time as a dependent variable has value too. Maslow and Mintz (1956), as cited by Sommer (1966), demonstrated the influence of the immediate environment upon an activity which seemingly was unrelated to the environment--as examiner testing subjects. An inverse relationship was observed between the test completion time and environments of increasing dishevelry, grayness, and evidence of poor maintenance (e.g., torn lampshades, tin can ashtrays, holes in the walls, etc.) The importance of the investigation is that subjects made no mention of the testing environment; yet, the environment played some role.

Nellen (1966) referred to the work by Dr. John Ott, one of the pioneers of time lapse photography. Ott has used various photographic techniques to observe behavior changes over time. A constant problem he faces is having to rely on controlled lighting, temperature, humidity, and other environmental conditions, but he nevertheless found that types of flourescent lighting played an important part in the health and maturing of blossoms and plants which he photographed. Ott extended his methods first to laboratory animals and eventually to people, and is currently refining his results. The importance of Ott's endeavors is that photographic records of human behavior over periods of weeks may be acquired and analyzed.

Time as a dependent variable may provide valuable clues not only in a limited setting, but with traffic confluenced which expose the individual to numerous settings. For example, time can be an index of environmental stimulation. Boutourline, ascited by Parr (1966), observed that "visitors at the Seattle World's Fair moved faster as the 'visual inventory' decreased in the direction in which they were going" (p. 41). Such a principle may be examined not only through specific hallways, but with simulation devices, through areas of an urban setting where the viewer has control over passage through the varieties of spaces.

Several dependent variables may be linked with time which, when listed, amount to attached observations. Time may be meaningfully related to feelings of satisfaction, fatigue, tension, etc., depending upon changes in the external stimulus properties as well as internal bodily states. Some effects may not show up on experiments of relatively short duration. These effects are important, and the need to find measurable intervals by which long term effects may be recorded is great.

Alternative Approaches to Measuring the Relationship between the Environment and Emotional Perception

An aspect of the relationship between color and emotion, which lacked any experimentation before the present study, is the influence of color on the interpretation of emotion. The concern for the present experiment was whether emotions could be successfully presented as a stimulus. As cited in the first chapter, communication of portrayed emotional states has been successful in a number of studies on judgments of emotion from sound, e.g., Kramer (1964) and Miller (1966). Hence, there was reason to believe that portrayed emotions on a tape might be a sensitive measure of differential responses between individuals and experimental conditions. As it turned out, the taped emotions received insignificant responses across experimental conditons. Thus, the question arises: What other experimental approaches should be tried?

Except for the experiments conducted by Pressey (1921), Lewinski (1938), Ross (1938), Gerard (1958), and the present experiment, color as a stimulus has been presented as square chips on a sheet of cardboard matting or some similar fashion. Only Pressey and Gerard had previously attempted to observe other than introspective responses.

Two possible experimental approaches were recommended by Norman and Scott (1952) to overcome the above problem. The first would be to pair a color with an unconditioned stimulus, which evokes an emotional reaction through successive presentations, until the color becomes a conditioned stimulus, evoking the same emotional reaction. The color, which becomes a conditioned stimulus for a certain emotion in the least number of successive presentations, may then be inferred to be "associated" to that emotion for the subject.

Although such an experiment attempts to avoid the epistomological dilemma of requiring a subject to respond to a word which is presumed to represent a given color, this approach is faced with three major difficulties. First, the context of the unconditioned stimuli should, ideally, be unchanged for the evocation of each emotion, otherwise there is a problem of determining whether the reaction stems from the stimulus or the context within the presentation of the stimulus. Film scenes, for example, could probably create emotional states to a reliable degree, but features of the film, e.g., actors, backdrops, music, dialogue, and other accompanying features of the stimuli might change with the creation of the desired emotional reaction.

A second difficulty is that operational definitions of distinct emotional states would have to be established. "Fear" and "anger" may be two emotions which can be predictably aroused and easily interpreted, but the other emotions elude behavioral criteria. How does one differentiate between related feelings, e.g., "pleasant" and "happy," "sad" and "depressing," "anger" and "hate," as well as between less related feelings, e.g., "sad" and "indifference," "anger" and "fear," "love" and "happy."

The third difficulty is that once emotions are reliably aroused and accurately recorded, a method is needed to measure the degree of arousal. For example, would the patterns of associations between stimuli and colors change whether the subject experiences a standardized stimulus intensely or mildly. Perhaps the variance of the response within an experimental group will be random, i.e., the experimental populations will have normal distributions of the intensity of the subjects' reactions, in which case, the within group subject differences would be cancelled out, but it would be desirable to have some way of determining the extent of the emotional reactions to distinguish subjects who we easily angered or saddened or susceptible to one particular emotion.

A consideration related to the above problem is the possibility that regardless of whether subjects respond intensely or mildly to the emotional stimuli, the consequent color-emotion associations may still be the same for all subjects. For example, red may still be associated to anger prior to the other color associations to that emotion inspite of the subject's relative ease of reacting to all emotional stimuli.

The second recommended experimental approach is to measure the effect of emotion on color perception in a before-after sequence. The subject would first be presented with a colored stimulus, which would be a blend of two primary colors, e.g., red-green and blue-yellow. The subject is asked to say what color he sees. Then, the subject is placed in a stress situation, which arouses a desired emotional state. Again, the subject is asked to say what color he sees. Potentially, the experiment could show whether there is an influence of emotions upon the interpretation of colors.

The basic problem with the experiment is again reliably evoking desired emotional states. "Fear" and "anger" could possibly be evoked with a high degree of predictability and accuracy, but there would be no measure of the intensity of the emotional state, and for other, harder-to-define emotion, it would appear to be extremely difficult to arouse them, e.g., "happiness," "flirting," "indifference," and "sadness." In addition, because the same subject is used for the *before* and *after* situations, he would be conscious of the relationship between color and emotion and might conjecture correctly that what is being measured is the affect of emotion on color perception, unless the color, emotion, color sequence were sufficiently subtle to elude the subject's awareness.

In spite of the above-mentioned experimental difficulties of both approaches, Norman and Scott have recommended solutions for establishing behavioral criteria of color-affect. The value of their recommendations can only be proven by experimentation.

One consideration of the present experiment, which may be critical, is that since subjects were asked to judge emotions experienced by others and in no way encouraged to participate in the experiences, it is possible that the subjects detached themselves from the immediate environment by focusing on what might be construed as an intellectual task. Perhaps a more sensitive measure could stem from a task where the subject is requested to show how he feels about the person undergoing the emotional experience. Since it has been shown that subjective moods of an individual and his physiological activity can be changed by placing him in different environments of color and light, it may be possible that by having the individual relate to the task in a less academic manner, he would be less detached and possibly more receptive, thus showing behavioral changes within several environmental contexts. The thematic Apperception Test cards, for example, where the individual is requested to ascribe a story to a picture, would offer several criteria for observing changes in feelings, thoughts, and behavior--feelings and thoughts by what the individual reports of the characters in a stimulus situation; and behavior, by what physiological changes are observed.

More Experimental Considerations

The analyses have been quite liberal, i.e., specific relationships were examined beyond those specified by the hypotheses. The primary emphasis of the examination has been for the purpose of pursuing questions of individual-environment interactions which seem potentially meaningful for future, more sensitive experimental studies. The results in the current experiments are not meant to apply to homes, schools, mental health centers, etc., where the environments are far more complex than laboratories. The attempt is to learn more of what to look for in our perplexing surroundings in terms of what in them, if anything, can influence our behavior. This final section discusses more considerations which bear upon the present experiment.

Few investigations, which include the environment, examine human responses within group situations. To design such a study does not appear prohibitively difficult and would seem to have great value since the majority of environmental spaces house social functions. For example, one could investigate the interpersonal processes in completing a task, which is accomplishable within a narrow experimental framework. For example, problem solving under varying environmental conditions, e.g., lighting, coloring, windowed vs. windowless, size and shape of work room, whether the room is cluttered or uncluttered, etc.; and in addition, the complexity of the problem may be varied to require more time, and hence, time could be included as an independent or dependent variable. The interaction between the individuals could be taped and analyzed according to the approach used by Bales (1953). Interactions would be classified into positive and negative categories. Positive interactions are giving help, joking, laughing, showing satisfaction, offering suggestions and directions; and negative interactions are disagreeing, rejecting ideas, increasing formality, withholding help, showing tension, withdrawing from participation, showing antagonism, attempting to deflate other's status, defending one's own position, and asserting one's self.

With the use of photography, group behavior may be observed in less contrived situations where no effort is made to manipulate either the environment or the individuals involved. For example, how would groups pass through various environmental set-ups which contained decision points, e.g., alternatives or interferences?

There is also the question of groups composed of both sexes. How, in the present experiment, would the results have changed if the experimental groups were not homogenously male or female, but a mixture of both? Again, seating arrangements may be important. If the subjects faced each other, would the increased opportunities for communication alter the results meaningfully? Is there a change in the mean responses depending upon the distance one sits from the environmental stimuli, e.g., center vs. periphery of a room, under vs. away from the light sources, etc.

There are several questions and aspects of the present study, which have not and need to be answered. Perhaps the major question is whether the data taken from individual-environment studies should be applied to some conceptual model. The data from the present research is too inconclusive to design theories of human behavior within environmental contexts, and for this reason no attempt shall be made.

Nevertheless, one approach, suggested by McLuhan (1966), has interest, if limited experimental applicability. In McLuhan's terms, the environments, as extensions of each person, are media of communication. The media shape and rearrange patterns of human association and community. Varying color and light in a given space serves only as a small indication of the flexibility and scope of what man has managed to achieve in making the external environment as malleable as his internal processes. The environmental media, then are capable of influencing perception of interpersonal communications just as changes in physiological processes may distort perception. Some of the more obvious forms of communication distortion by environmental artifacts are easily recognized, e.g., fish eye lens dispersing visual impressions, superimposing one composition over another, and other techniques of trick photography, colored glasses, stage designs, manipulation of architectural spaces to create the impression that there is more area or less area than exists, etc. But some of the less obvious media, e.g., telephones diminishing voice quality, lighting in homes and offices, wall colors, textures of furniture, visual patterns, room shapes, etc., in the surroundings may have great effect.

To show the personal side of the interface between the individual and an environmental medium, McLuhan cited an incident.

> Recently an imaginative school principal in a slum area provided each student in the school with a photograph of himself. The classrooms of the school were abundantly supplied with large mirrors. The result was an astounding increase in the learning rate (p. 120).

Thus, the slum child, with little orientation, does not see himself becoming anything or going any place, but with a slight modification within his surroundings, he is no longer blind to the opportunities available to him.

The present experiment is an exploratory investigation into the field of environmental influences. Careful and extensive interdisciplinary research on a behavioral basis is needed to comprehend factors mediating the psychological effects of color, illumination, shapes, aggregates of people, complexities of visual patterns, and so forth, within the physical world. Systematic experimentation is still new and fragmentary.

CHAPTER VII

SUMMARY AND CONCLUSIONS

The aim of this study was to explore possible differences in the interpretation of an expressed emotion's intensity as a function of painted hues and light intensities within the environment. A review of the literature pertaining to color effects and the feasibility of accurately decoding vocal qualities and speech content from voice recordings was cited. It was found that the present study differed from previous research in five ways: (1) Several studies have indicated that color arouses emotional reactions, but no study has sought the effects of color on the interpretation of portrayed emotions. (2) One study (Gerard, 1958) measured the effect of hue in a room with colored lights, but no study had attempted to measure the influence of painted commercial hues in identical spaces. (3) No study had measured the effect of color and light without the subject's knowledge of them as important variables in the study. (4) Much research had been conducted on the effects of illumination in a room, but no study systematically varied achromatic lighting to seek out the emotional significance of illumination. And (5) few environmental studies had included time as either an independent or dependent variable, i.e., the mean judgments were analyzed in terms of three equal and sequential segments of time during a standardized testing session.

The tape recording used in the experiment, which was created by the Clinical Psychology Program at the University of Utah, contained 204 portrayals of six emotions (fear, anger, indifference, happy, sad, and flirting). The portrayals were repeated by different speakers and stimuli order was randomized.

Data from previous research were used to generate hypotheses, which were: (1) The judged intensities of emoted phrases differ significantly across varying combinations of color and light for all six emotions. (2 The judgments assume the following patterns:

a. The mean judgment of the emotion anger increases significantly over the mean judgments of the other emotions under the conditions of a red room and a yellow room (illumination level "bright".)

b. The mean judgment of the emotion sad increases significantly over the mean judgments of the other emotions under the condition of a blue room (illumination level "dim").

c. The mean judgment of the emotion happy increases significantly over the mean judgments of the other emotions under the conditions of dark hue lightness and medium lightness room (illumination level "comfortable").

d. The mean judgment of the emotion fear increases significantly over the mean judgments of the other emotions under the condition of a *blue room* and *yellow room* (illumination level "dim").

e. The mean response to the portrayal of *flirting* increases significantly over the mean responses to other portrayals under the conditions of a *dark red room* (illumination level "dim").

(3) The mean judgment of each emotion differs significantly between men and women. (4) The mean judgment of each emotion differs significantly with increased exposure of the subjects to the varying conditions.

The statistical treatment employed was initially a factorial analysis of variance to test for global effects followed by numerous single factor analyses of variance to examine specific questions.

Two of the four hypotheses were not supported by the results; there were no significant differences in the mean judgment of an emotion's intensity with variations of room color, hue lightness, and illumination. The third hypothesis on differential judgments of emotions by sex was confirmed in part; and the fourth hypothesis on differential judgments over time was confirmed in full.

It was noted that although the mean judgments differed between sexes and over time, the variables responsible for such differences could not necessarily stem from the physical environment. For example, of seven analyses of variance for sex differences in relation to the environmental variables, three showed significance; and significant differences over time may be a function of the tape stimuli, fatigue, anticipation of session's end, and the like.

Three alternative explanations of the results were discussed. They are: (1) the possibility that human perception of emotional portrayals are not effected by environmental changes; (2) the measure of the dependent variable used is too insensitive for recording environmental effects within the time allowed; and (3) the need for additional dependent variables to display the effects of the environment and to consider other experimental approaches.

No attempt was made to extrapolate the meaning of the results beyond laboratory conditions since few of the tests showed significance. Instead, the focus was on potential further avenues of research which could be gleaned from the present data for similar investigations in the future.

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APPENDIX

INSTRUCTIONS

In the following tape you will hear 480 phrases. Each phrase ("hello," "good morning," or "how are you?") is spoken with a different feeling. Some are spoken by a man, others by a woman. After hearing each phrase, your task is to decide how intensely a particular emotion is expressed in the phrase. Indicate your choice on the scales on the answer sheets. Mark the spaces between the lines over the number which best rates the intensity of the communicated feeling. Please mark only one choice for each phrase. A few seconds before each phrase you will hear a number. Make sure that your rating on the scale on the answer sheet goes with the number spoken in the tape recording. If any items are not clear, make a guess anyway.

Sample

in the left hand column of your answer sheets is the emotion which goes with the spoken phrase. To the right of each listed emotion is a nine point scale. The first item in the tape is preceded by the spoken number "one." The first emotion on the answer sheets is FEAR. if you feel that the phrase contains none of that emotion, place your mark as follows:

1. FEAR Not fearful _x_/___/___/___/___/___/___/___/___
1 2 3 4 5 6 7 8 9 Very much fearful

If you feel that the phrase contains very much of that emotion, place your mark as follows:

1. FEAR Not fearful ___/___/___/___/___/___/___/___/_x_
1 2 3 4 5 6 7 8 9 Very much fearful

If you feel that the phrase contains that emotion to a degree which is in between the extreme alternatives of 1 and 9 intensities, place your mark in that space above the number which best rates the intensity of that feeling.

On the answer sheets, the listed emotions FLIRT. and INDIFF. are abbreviations for FLIRTING and INDIFFERENCE.

ARE THERE ANY QUESTIONS?

ANSWER SHEET

1. FEAR Not fearful ___/___/___/___/___/___/___/___/___Very much fearful
1 2 3 4 5 6 7 8 9

2. ANGER Not angry ___/___/___/___/___/___/___/___/___ Very much angry
1 2 3 4 5 6 7 8 9

3. ANGER Not angry ___/___/___/___/___/___/___/___/___/Very much angry
1 2 3 4 5 6 7 8 9

4. INDIFF.Not indiff. ___/___/___/___/___/___/___/___/___Very much indiff.
1 2 3 4 5 6 7 8 9

5. FEAR Not fearful ___/___/___/___/___/___/___/___/___Very much fearful
1 2 3 4 5 6 7 8 9

6. FEAR not fearful ___/___/___/___/___/___/___/___/___very much fearful
1 2 3 4 5 6 7 8 9

7. FEAR not fearful ___/___/___/___/___/___/___/___/___very much fearful
1 2 3 4 5 6 7 8 9

8. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

9. ANGER not angry ___/___/___/___/___/___/___/___/___ very much angry
1 2 3 4 5 6 7 8 9

10. **SAD** not sad___/___/___/___/___/___/___/___/___/very much sad
1 2 3 4 5 6 7 8 9

11. **INDIFF.** not indiff.___/___/___/___/___/___/___/___/___/very much indiff.
1 2 3 4 5 6 7 8 9

12. **INDIFF.** not indiff.___/___/___/___/___/___/___/___/___ very much indiff.
1 2 3 4 5 6 7 8 9

13. **SAD** not sad___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

14. ANGER not angry___/___/___/___/___/___/___/___/___ very much angry
1 2 3 4 5 6 7 8 9

15. FLIRT. not flirt.___/___/___/___/___/___/___/___/___ very much flirt.
1 2 3 4 5 6 7 8 9

16. INDIFF. not indiff.___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

17. ANGER not angry ___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

18. HAPPY not happy___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

19. SAD not sad___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

20. ANGER not angry___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

21. FEAR not fearful___/___/___/___/___/___/___/___/___ very much fearful
1 2 3 4 5 6 7 8 9

22. HAPPY not happy___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

23. ANGER not angry___/___/___/___/___/___/___/___/___ very much angry
1 2 3 4 5 6 7 8 9

24. INDIFF. not indiff.___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

25. SAD not sad___/___/___/___/___/___/___/___/___ very much sad
1 2 3 4 5 6 7 8 9

26. INDIFF. not indiff.___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

Answer Sheet (2)

27. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___very much flirt.
1 2 3 4 5 6 7 8 9

28. HAPPY not happy ___/___/___/___/___/___/___/___/___/very much happy
1 2 3 4 5 6 7 8 9

29. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___/very much indiff.
1 2 3 4 5 6 7 8 9

30. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

31. ANGER not angry ___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

32. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

33. ANGER not angry ___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

34. ANGER not angry ___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

35. HAPPY not happy ___/___/___/___/___/___/___/___/___ very much happy
1 2 3 4 5 6 7 8 9

36. SAD not sad ___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

37. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

38. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

39. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

40. ANGER not angry ___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

41. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___very much flirt.
1 2 3 4 5 6 7 8 9

42. ANGER not angry ___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

43. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

44. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

45. SAD not sad ___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

46. SAD not sad ___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

47. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

48. FEAR not fearful ___/___/___/___/___/___/___/___/___very much fearful
1 2 3 4 5 6 7 8 9

49. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

50. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___very much flirt.
1 2 3 4 5 6 7 8 9

51. FEAR not fearful ___/___/___/___/___/___/___/___/___
1 2 3 4 5 6 7 8 9 very much fearful

Answer Sheet (3)

52. SAD not sad ___/___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

53. HAPPY not happy ___/___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

54. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___/___very much flirt.
1 2 3 4 5 6 7 8 9

55. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___/___very much flirt.
1 2 3 4 5 6 7 8 9

56. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

57. FEAR not fearful ___/___/___/___/___/___/___/___/___/___ very much fearful
1 2 3 4 5 6 7 8 9

58. HAPPY not happy ___/___/___/___/___/___/___/___/___/___ very much happy
1 2 3 4 5 6 7 8 9

59. FEAR not fearful ___/___/___/___/___/___/___/___/___/___very much fearful
1 2 3 4 5 6 7 8 9

60. FEAR not fearful ___/___/___/___/___/___/___/___/___/___very much fearful
1 2 3 4 5 6 7 8 9

61. HAPPY not happy ___/___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

62. FEAR not fearful ___/___/___/___/___/___/___/___/___/___very much fearful
1 2 3 4 5 6 7 8 9

63. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

64. ANGER not angry ___/___/___/___/___/___/___/___/___/___/very much angry
1 2 3 4 5 6 7 8 9

65.HAPPY not happy ___/___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

66. ANGER not angry ___/___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

67. ANGER not angry ___/___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

68. SAD not sad ___/___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

69. HAPPY not happy ___/___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

70. ANGER not angry ___/___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

71. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___/___very much flirt.
1 2 3 4 5 6 7 8 9

72. FEAR not fearful ___/___/___/___/___/___/___/___/___/___very much fearful
1 2 3 4 5 6 7 8 9

73. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___/___very much flirt.
1 2 3 4 5 6 7 8 9

74. FEAR not fearful ___/___/___/___/___/___/___/___/___/___very much fearful
1 2 3 4 5 6 7 8 9

75. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

76. SAD not sad ___/___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

77. SAD not sad ___/___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

Answer Sheet (4)

78. SAD not sad ___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

79. SAD not sad ___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

80. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

81. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

82. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

83. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

84. FEAR not fearful ___/___/___/___/___/___/___/___/___/very much fearful
1 2 3 4 5 6 7 8 9

85. FEAR not fearful ___/___/___/___/___/___/___/___/___very much fearful
1 2 3 4 5 6 7 8 9

86. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

87. FEAR not fearful ___/___/___/___/___/___/___/___/___very much fearful
1 2 3 4 5 6 7 8 9

88.FLIRT. not flirt. ___/___/___/___/___/___/___/___/___ very much flirt.
1 2 3 4 5 6 7 8 9

89. ANGER not angry ___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

90. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

91. SAD not sad ___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

92. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___ very much indiff.
1 2 3 4 5 6 7 8 9

93. FEAR not fearful ___/___/___/___/___/___/___/___/___ very much fearful
1 2 3 4 5 6 7 8 9

94. ANGER not angry ___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

95. INDIFF. not indiff. _/_/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

96. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

97. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___very much flirt.
1 2 3 4 5 6 7 8 9

98. SAD not sad ___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

99. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

100. SAD not sad ___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

101. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

102. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___/very much indiff.
1 2 3 4 5 6 7 8 9

103. SAD not sad ___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

Answer Sheet (5)

104. SAD not sad ___/___/___/___/___/___/___/___/___very much sad

1 2 3 4 5 6 7 8 9

105. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___very much flirt.

1 2 3 4 5 6 7 8 9

106. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy

1 2 3 4 5 6 7 8 9

107. SAD not sad ___/___/___/___/___/___/___/___/___very much sad

1 2 3 4 5 6 7 8 9

108. SAD not sad ___/___/___/___/___/___/___/___/___very much sad

1 2 3 4 5 6 7 8 9

109. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___very much indiff.

1 2 3 4 5 6 7 8 9

110. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy

1 2 3 4 5 6 7 8 9

111. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___very much indiff.

1 2 3 4 5 6 7 8 9

112. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___very much flirt.

1 2 3 4 5 6 7 8 9

113. ANGER not angry ___/___/___/___/___/___/___/___/___very much angry

1 2 3 4 5 6 7 8 9

114. HAPPY not happy.___/___/___/___/___/___/___/___/___very much happy

1 2 3 4 5 6 7 8 9

115. ANGER not angry ___/___/___/___/___/___/___/___/___very much angry

1 2 3 4 5 6 7 8 9

116. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___very much indiff.

1 2 3 4 5 6 7 8 9

117. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy

1 2 3 4 5 6 7 8 9

118. ANGER not angry ___/___/___/___/___/___/___/___/___very much angry

1 2 3 4 5 6 7 8 9

119. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy

1 2 3 4 5 6 7 8 9

120. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy

1 2 3 4 5 6 7 8 9

121. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___very much flirt.

1 2 3 4 5 6 7 8 9

122. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___very much flirt.

1 2 3 4 5 6 7 8 9

123. INDIFF. Not indiff. ___/___/___/___/___/___/___/___/___very much indiff.

1 2 3 4 5 6 7 8 9

124. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___very much indiff.

1 2 3 4 5 6 7 8 9

125. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___/very much indiff.

1 2 3 4 5 6 7 8 9

126. SAD not sad ___/___/___/___/___/___/___/___/___/very much sad

1 2 3 4 5 6 7 8 9

127.SAD not sad ___/___/___/___/___/___/___/___/___very much sad

1 2 3 4 5 6 7 8 9

128. ANGER not angry ___/___/___/___/___/___/___/___/___very much angry

1 2 3 4 5 6 7 8 9

129. SAD not sad ___/___/___/___/___/___/___/___/___very much sad

1 2 3 4 5 6 7 8 9

Answer Sheet (6)

130. SAD not sad ___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

131. SAD not sad ___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

132. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

133. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___very much flirt.
1 2 3 4 5 6 7 8 9

134. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

135. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

136. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

137.FEAR not fearful ___/___/___/___/___/___/___/___/___very much fearful
1 2 3 4 5 6 7 8 9

138. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

139. INDIFF. not indiff. ___/___ ___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

140. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

141. FEAR not fearful ___/___/___/___/___/___/___/___/___very much fearful
1 2 3 4 5 6 7 8 9

142. SAD not sad ___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

143. HAPPY not happy ___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

144. SAD not sad ___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

145. FEAR not fearful ___/___/___/___/___/___/___/___/___very much fearful
1 2 3 4 5 6 7 8 9

146. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___very much flirt.
12 2 3 4 5 6 7 8 9

147. ANGER not angry ___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

148. SAD not sad ___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

149. FEAR not fearful ___/___/___/___/___/___/___/___/___very much fearful
1 2 3 4 5 6 7 8 9

150. SAD not sad ___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

151. ANGER not angry ___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

152. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___very much flirt.
1 2 3 4 5 6 7 8 9

153. FEAR not fearful ___/___/___/___/___/___/___/___/___very much fearful
1 2 3 4 5 6 7 8 9

154. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___very much flirt.
1 2 3 4 5 6 7 8 9

Answer Sheet (7)

155. INDIFF. not indiff ___/___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

156. HAPPY not happy ___/___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

157. HAPPY not happy ___/___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

158. ANGER not angry ___/___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

159. ANGER not angry ___/___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

160. ANGER not angry ___/___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

161. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

162. ANGER not angry ___/___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

163. SAD not sad ___/___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

164. HAPPY not happy ___/___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

165. HAPPY not happy ___/___/___/___/___/___/___/___/___/___ very much happy
1 2 3 4 5 6 7 8 9

166. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___/___ very much flirt.
1 2 3 4 5 6 7 8 9

167. FEAR not fearful ___/___/___/___/___/___/___/___/___/___very much fearful
1
1 2 3 4 5 6 7 8 9

168. ANGER not angry ___/___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

169. SAD not sad ___/___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

170. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___/___very much indiff.
1 2 3 4 5 6 7 8 9

171. FEAR not fearful ___/___/___/___/___/___/___/___/___/___very much fearful
1 2 3 4 5 6 7 8 9

172. ANGER not angry ___/___/___/___/___/___/___/___/___/___very much angry
1 2 3 4 5 6 7 8 9

173. SAD not sad ___/___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

174. HAPPY not happy ___/___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

175. HAPPY not happy ___/___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

176. HAPPY not happy ___/___/___/___/___/___/___/___/___/___very much happy
1 2 3 4 5 6 7 8 9

177. SAD not sad ___/___/___/___/___/___/___/___/___/___very much sad
1 2 3 4 5 6 7 8 9

178. FLIRT. Not flirt. ___/___/___/___/___/___/___/___/___/___very much flirt.
1 2 3 4 5 6 7 8 9

179. FEAR not fearful ___/___/___/___/___/___/___/___/___/___very much fearful
1 2 3 4 5 6 7 8 9

Answer Sheet (8)

180. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___/___very much flirt.

1 2 3 4 5 6 7 8 9

181. FEAR not fearful ___/___/___/___/___/___/___/___/___/___very much fearful

1 2 3 4 5 6 7 8 9

182. HAPPY not happy ___/___/___/___/___/___/___/___/___/___very much happy

1 2 3 4 5 6 7 8 9

183. FEAR not fearful ___/___/___/___/___/___/___/___/___/___very much fearful

1 2 3 4 5 6 7 8 9

184. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___/___very much indiff.

1 2 3 4 5 6 7 8 9

185. FEAR not fearful ___/___/___/___/___/___/___/___/___/___very much fearful

1 2 3 4 5 6 7 8 9

186. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___/___very much indiff.

1 2 3 4 5 6 7 8 9

187. HAPPY not happy ___/___/___/___/___/___/___/___/___/___very much happy

11 2 3 4 5 6 7 8 9

188. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___/___very much flirt.

1 2 3 4 5 6 7 8 9

189. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___/___very much indiff.

1 2 3 4 5 6 7 8 9

190. HAPPY not happy ___/___/___/___/___/___/___/___/___/___very much happy

1 2 3 4 5 6 7 8 9

191. FEAR not fearful ___/___/___/___/___/___/___/___/___/___very much fearful

1 2 3 4 5 6 7 8 9

192. FEAR not fearful ___/___/___/___/___/___/___/___/___/___very much fearful

1 2 3 4 5 6 7 8 9

193. FEAR not fearful ___/___/___/___/___/___/___/___/___?___very much fearful

1 2 3 4 5 6 7 8 9

194. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___/___very much indiff.

1 2 3 4 5 6 7 8 9

195. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___/___very much flirt.

1 2 3 4 5 6 7 8 9

196. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___/___very much flirt.

1 2 3 4 5 6 7 8 9

197. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___/___very much flirt.

1 2 3 4 5 6 7 8 9

198. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___/___very much flirt.

1 2 3 4 5 6 7 8 9

199. FEAR not fearful ___/___/___/___/___/___/___/___/___/___very much fearful

1 2 3 4 5 6 7 8 9

200. SAD not sad ___/___/___/___/___/___/___/___/___/___/very much sad

1 2 3 4 5 6 7 8 9

201. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___/___very much indiff.

1 2 3 4 5 6 7 8 9

202. INDIFF. not indiff. ___/___/___/___/___/___/___/___/___/___very much indiff.

1 2 3 4 5 6 7 8 9

203. FLIRT. not flirt. ___/___/___/___/___/___/___/___/___/___very much flirt.

1 2 3 4 5 6 7 8 9

204. HAPPY not happy ___/___/___/___/___/___/___/___/___/___very much happy

1 2 3 4 5 6 7 8 9